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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July and August. Its scope is the publication of the results of original research in all departments of Natural History.

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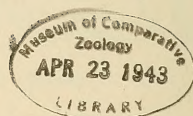
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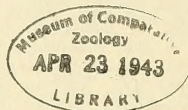
No. 1

FURTHER BIRD NOTES FROM GASPE, QUEBEC

By STANLEY C. BALL

Yale University

33,343



IN the October and November numbers of this periodical in 1938 I reported upon 117 species of birds from the Gaspé Bay region. Ninety-eight of these were seen on the Forillon during the summers of 1936 and 1937. Having spent the four succeeding summers and the autumns of 1940 and 1941 in ornithological studies in this interesting region, I can record observations on 31 additional species. Nine of these records resulted from extending the work into the autumn—until October 28, 1940, and November 5, 1941. They may be regarded as normal to this season. Some of the others are more remarkable. Changes in the status of certain forms previously recorded may also be noted. Through the hospitality of Mr. R. Charles Lindsay I was enabled to make frequent observations along the southern shore of the Bay, and on the tidal flats of the barachois at the mouth of the St. John River between Douglastown and Haldimand.

In the annotated list an asterisk indicates a first record of the species for the Gaspé Bay region.

Ardea herodias. GREAT BLUE HERON.—In 1938 it was learned by Mr. Lindsay that the herons often seen feeding around Gaspé Bay, especially on the mud flats at the mouths of the Dartmouth and St. John rivers, are members of a colony situated not far from the shore of the Bay. About 100 nests with young able to fly were examined on July 26th in a mixed growth of birches and conifers well hidden in a considerable tract of forest on a low flat-topped hill. Although no accurate counts of nests have been made, the number of herons to be seen on the feeding grounds has varied from season to season. In August 1938 it was not unusual at low tide to see between 30 and 40 together on the Dartmouth flats. The numbers were much smaller in 1941, never more than 9 being seen. The Douglastown flats, however, were somewhat more popular. As many as 15 were counted there in September and October. Four were still present October 10th, and one on the 18th.

This colony may prove to be the most northerly in Eastern North America. The four birds on Anticosti since 1861, as recorded by Lewis (*Can. Field-Nat.* 38: 74. 1924), were probably stragglers.

Nycticorax nycticorax. BLACK-CROWNED NIGHT HERON.—Evidently no colony exists near Gaspé Bay, for only two birds have been

seen since 1937, and both were stray visitors to the Forillon—Aug. 20, 1938, and Sept. 13, 1940. None have been seen on the estuaries. P. A. Taverner found this species common at Gaspé in 1914 and 1915. (Townsend, *Can. Field-Nat.* 34: 91. 1920.)

Dafila acuta.* PINTAIL.—Two feeding on York River flats at Sunnybank, among about 100 black ducks, Oct. 2, 1941; five Oct. 5th at Wakeham near the opposite shore of the same estuary. That the bird is rare in Gaspé would be expected from its known distribution. Duck hunters consulted were unacquainted with it. C. W. Townsend and G. M. Allen (*Proc. Boston Soc. Nat. Hist.* 33: 328. 1906-7) reported 7 pintails recorded from 4 localities in Labrador and Ungava.

Nettion carolinense.* GREEN-WINGED TEAL.—About 50 seen in September and October 1941, about the grassy flats in Wakeham at the mouth of the York River. Hunters considered them more numerous than usual. Lewis records many on Anticosti.

Clangula hyemalis. OLD-SQUAW.—About 30 off Cape Gaspé from October 20, 1941, until my departure Nov. 5th.

Melanitta deglandi. WHITE-WINGED SCOTER.—Common off Cape Gaspé in late October, 1940.

Oidemia americana. AMERICAN SCOTER.—A male and 2 females off the cliffs on the north-east side of the Forillon, October 30, 1941.

Squatarola squatarola.* BLACK-BELLIED PLOVER.—Curiously enough I did not observe this species about Gaspé Bay until 1940, when they were fairly common on the tidal flats at St. Marjorie and at Haldimand. While encamped at the latter from October 3rd-9th, flocks of 5 to 20 were seen daily. At dawn and again at sunset a few fed in the grass fields bordering the Bay. Old hunters recount the great numbers procurable years ago, both of this species, and, if their descriptions may be relied upon, the golden plover.

In 1941 a single black-bellied plover was seen near Douglastown October 20th, and a flock of 15, Nov. 6th, at Rivière Madeleine on south shore of the St. Lawrence.

C. W. Townsend, August 21, 1919, "saw two flocks of a dozen each feeding back of the barachois at Douglastown in the brackish marshes" (on the same feeding grounds that Haldimand faces).

Philohela minor. WOODCOCK.—As I reported in 1938, a few woodcock breed on the Forillon. Apparently they were not uncommon in autumn, 1941, along the York River from 10 to 30 miles west of Gaspé Basin. Two were seen clearly at close range in the strong light from an automobile at points nearly a mile apart along the road on the evening of September 10. As I stood in a small opening 4 miles farther westward at dawn on October 10th, 3 woodcock flew past me at intervals of a few moments, and settled among alders beside a small stream. Search of excellent cover and feeding grounds at the mouth of Dartmouth River disclosed a few Wilson's snipe, but no woodcock.

Brewster saw one near Gaspé in 1881. Tavernier heard that one was shot there in 1915 or 1916 (Townsend, *Can. Field-Nat.* 34: 91. 1920), and Lewis (*Ibid.* 48: 102. 1934) saw one July 27, 1933, on Bald Island, Betchewun Bird Sanctuary, east of Havre St. Pierre, Labrador.

Phaeopus hudsonicus. HUDSONIAN CURLEW.—A few small flocks seen each year since 1938. Earliest date Aug. 20th; latest Sept. 4th. On two occasions curlews have passed south through the Grande Grève portage.

Totanus flavipes.* LESSER YELLOW-LEGS.—A single immature bird seen Oct. 7-8, 1940, at Haldimand. Spent most of time on beach, but once ascended bank and stood quietly in edge of lawn, 20 feet from camp window.

Calidris canutus.* KNOT.—Two at Haldimand, Sept. 2, 1939, tamely permitted me to sketch and photograph them at a distance of 8 feet. None seen during 1940 and 1941. Lewis reports it as rare on Anticosti. He saw 3 on Bald Island, Betchewun Bird Sanctuary, southern Labrador.

[*Psibia minutilla*. LEAST SANDPIPER.—Curiously enough I have been unable to find this species among its customary travelling companions, the semipalmated sandpipers, sanderlings, and plovers.]

Pelidna alpina.* RED-BACKED SANDPIPER.—Uncommon in autumn, 1940, 1941. Never more than 2 seen together, usually in company with *Ereunetes pusillus* and *Charadrius semipalmatus*.

Ereunetes pusillus. SEMIPALMATED SANDPIPER.—Uncommon in autumn at Haldimand and Cap des Rosiers.

Limosa haemastica.* HUDSONIAN GODWIT.—October 7, 1940, one feeding on the grassy bank of a small brook 50 meters from its entry into the St. John estuary. Flew wildly when disturbed.

Crocethia alba.* SANDERLING.—Fairly common at Haldimand and on the Sandy Beach peninsula, October 5th-30th.

Stercorarius sp. LONG-TAILED or PARASITIC JAEGER.—On August 14, 1940, fishermen reported on the beach at Grande Grève a strange bird that proved to be a jaeger. At a distance

of 10 meters it allowed me to sketch it for half an hour. Finally disturbed by a dog, it joined a large flock of gulls resting on the water 100 meters off shore. The fishermen, who have a kindly interest in the gulls that clean the offal from the fishing beaches, had already made this jaeger a welcome guest. Not only was it the first ever seen by them, but its relative fearlessness made it a favorite. I had opportunities to watch it daily until its disappearance on the 19th. My reluctance to make a specimen of the bird was appreciated by the Grande Grève fishermen, but some days later it was reported dead on the beach at Cap-aux-Os farther up the Bay. Search was unavailing.

Being ignorant of the comparative differences in the bills of jaegers, I did not, on the first and closest view of this bird, note the relative length of nasal sheath and nail. But with the aid of Forbush's description (*Birds of Mass., etc.*, 1: 56) it was tentatively determined as *S. longicaudus*, rather than *parasiticus*, by its light bluish legs, distinctly buffy upper tail coverts, and lack of the interrupted band of whitish across the base of the primaries.

The only certain previous record of this species in the region about the St. Lawrence Gulf seems to be the bird taken on Anticosti in August 1900 and reported by Schmitt (H. F. Lewis, *Can. Field-Nat.*, 38: 45. 1924). Townsend and Allen (*Proc. Boston Soc. Nat. Hist.*, 33: 310. 1906-07) erroneously cited as *longicaudus* the parasitic jaeger seen by Brewster July 20, 1881, near Mingan Harbor, Labrador.

That the likelihood of jaegers visiting the Gulf of St. Lawrence in 1941 was unusually great appears from the comments by Mr. Ludlow Griscom in *The Season* (CXL) for the period August 1-September 1, 1941. "One of the three great flights of history. I myself saw 169 parasitic, and at least 11 long-tailed jaegers at Monomoy (Mass.)."

Larus hyperboreus. GLAUCOUS GULL.—One adult joined the flock of 250 herring gulls at Grande Grève, November 1, 1941, feeding with them on the beach and in the steep sloping fields where fish offal had been spread as fertilizer. Still present on the 5th, my last day there. Lewis saw one on the beach at Cap des Rosiers, Dec. 9, 1921 (*Can. Field-Nat.*, 36: 98. 1922).

Larus philadelphia.* BONAPARTE'S GULL.—Common migrant, especially about the upper end of the Bay. A flock of 124, first observed off Peninsula beach Sept. 16, 1940, were still there on the 23rd. About 20 fished off Haldimand beach from October 17-20, 1941.

Coccyzus americanus.* BLACK-BILLED CUCKOO.—A lone individual lived among the shrubbery and dooryard trees at Grande Grève from about June 25 to July 19, 1941. I first saw the bird when it sidled along a rail in our garden fence and took a green caterpillar from the monkshood plants. Our next-door neighbor informed me that this "long-tailed brown bird" had been about for two weeks.

It was seen daily in our yard until the 16th. The next observation was made on the 19th by another neighbor 200 meters to the eastward. Her garden also contained monkshood plants with their supply of insects. No further report of this waif was received.

Bubo virginianus. HORNE OWL.—None seen, but heard at York Lake Aug. 29, 1940; on Dartmouth River Sept. 6, 1940; on York River thirty miles inland, Oct. 10, 1941.

Nyctea nyctea. SNOWY OWL.—Doubtless a few enter Gaspé from the north each fall. I have been informed of half a dozen seen during the last 20 years—one of them at Cape Gaspé by Mr. Arthur Minchinton, the lighthouse keeper.

I watched a female (?) for half an hour on the morning of October 30, 1941, as it hunted along the bar between Haldimand and Douglastown. Probably mice, whose tracks in the beach sand were numerous between the storm-thrown timbers and stumps, were the objects of its search, for it paid no attention to several small flocks of golden-eyes that passed low overhead, nor to scoters and mergansers fishing close to shore within easy striking distance.

Two other snowy owls were shot near Gaspé Basin in late October 1941. Probably these birds were members of the wave that swept on into New England.

Surnia ulula caparoch. HAWK OWL.—A male was taken in mixed forest beside the St. John River, 6 miles inland, October 2, 1941. Injured only in the wing, it was kept alive three days, photographed and drawn. A docile and wholly captivating captive, it learned to eat meat and to drink from a spoon. At intervals during the first day and night, perhaps because of its uncomfortable wing, it uttered rather high, loud, musical chirrups and rattling notes. At such times especially it appeared to enjoy having its head gently stroked. On the third morning it was found dead.

The lighthouse keeper at Cape Gaspé, Mr. Alfred Minchinton, shot an owl there on about the same date. I judged from his description that it also was a hawk owl.

Strix varia. BARRED OWL.—Robert Brown and Hulda Shaw saw one near St. George's Cove, July 12, 1938; first Forillon record.

Asio wilsonianus. LONG-EARED OWL.—One shot at Grande Grève on the evening of August 7, 1941, the second Gaspé record.

Picoides tridactylus. AMERICAN THREE-TOED WOODPECKER.—Two seen at York Lake August 25th, and another on a northern tributary of the York River August 29, 1941. None seen nearer than 30 miles from the Bay. Probably present but uncommon through the interior.

Tyrannus tyrannus. EASTERN KINGBIRD.—Rare. One seen on two occasions at St. Marguerite, August 18, 1938, and a few days later; one at Shiphead Settlement about one-half

mile from Cape Gaspé, July 31, 1940. In 1941, although I had more opportunities for observation west of Grande Grève than in previous years, all records of this species were from the Forillon. June 18th two passed westward through Grande Grève; July 2-3, one seen at Grande Grève. Possibly two individuals were involved, for on July 7th a pair was seen twice during the forenoon about the same barnyard fence and trees that had attracted the 1940 individual. In neither year did they nest on the Forillon.

Mrs. Wilson Roberts, in whose dooryard these last mentioned Kingbirds appeared, has given me an admittedly doubtful record.

Empidonax minimus. LEAST FLYCATCHER.—On more than one occasion I have been temporarily deceived by "chebec" calls issuing from *E. flaviventris*. But on July 3, 1941, I watched a *minimus* at close quarters in a brushy pasture behind Cap des Rosiers at the foot of Mt. St. Alban's cliffs. Lewis reported one seen on Anticosti June 15, 1922 (*Can. Field-Nat.*, 38: 125, 1924).

Myiochanes virens. WOOD PEWEE.—On July 24, 1941, the hottest morning in my Gaspé experience (74° at 5.30 and 88° at 10.30), a bird of this species, supposedly a male, spent half an hour in a group of spruce at Grande Grève. I had excellent opportunity to observe it and to hear both its rising and descending calls.

Riparia riparia. BANK SWALLOW.—About 30 pairs have nested every year since I first was shown their holes in 1938 at Haldimand. Here on the south shore of the Bay, in a bank that rises from 7 to 9 feet above high tide mark at the edge of the beach, their burrows penetrate the sandy subsoil.

Certhia familiaris. BROWN CREEPER.—Uncommon or rare. I have previously recorded one at Ross Lake, August 3, 1936. On July 19, 1939, a pair was seen feeding young in an old dying birch near the edge of the 700 foot cliffs that overlook the Gulf north of Indian Cove. Considering this creeper, by its obliterative colour, weak high notes, and general behaviour, about the least likely of our birds to attract attention, I presume others have escaped unnoticed.

Hylocichla guttata. HERMIT THRUSH.—One pair nested in the edge of dense fir forest behind Grande Grève in 1939, the first breeding record on the Forillon.

Anthus spinoletta. AMERICAN PIPIT.—Fairly common migrant during September.

Lanius borealis. NORTHERN SHRIKE.—First seen October 11, 1940, at Cap aux Os, one or more hunted along the Bay slope until October 25, when I shot an adult male that had been molesting migratory robins since the 17th.

In 1941 first seen 30 miles up York River (immature shot) October 7th; another immature taken in the same vicinity Oct. 10th. One struck at robin Oct. 22nd; another pursuing chickadees and sparrows at Grande Grève Oct. 25th and 27th.

Sturnus vulgaris. EUROPEAN STARLING.—Since 1937 report the status has not changed significantly. Probably not more than 50 pairs have nested in the region about Gaspé Bay in any one year. A slight decline has been noted on the Forillon.

Vireo philadelphicus. PHILADELPHIA VIREO.—Apparently since 1937 there has been a withdrawal of this species from the northeastern Gaspé region. Having been deceived by more than one unusually rapid utterance by *olivaceus*, I hesitate to record even tentatively either species unless clearly seen. Not only have all birds actually observed in years 1938-1941 been *olivaceus*, but few songs have suggested *philadelphicus*.

Mniotilta varia. BLACK-AND-WHITE CREEPER.—Sang three times July 3, 1941, on talus slope of Mt. St. Alban at Cap des Rosiers. My few previous Gaspé records have been fall migrants.

Dendroica aestiva. YELLOW WARBLER.—Increasing in numbers around Gaspé Bay, along the rivers and in the "burns". Whereas none nested on the Forillon during 1936 and 1937, 2, 4, 4, and 5 pairs have done so in the years 1938-1941.

Dendroica pensylvanica.* CHESTNUT-SIDED WARBLER.—It was a remarkable coincidence that on July 2, 1941, a few moments after seeing the first Gaspé least flycatcher, I heard and watched closely the only specimen of this warbler thus far recorded—a male. The two birds were singing together 100 meters apart in brushy land back of Cap des Rosiers. Neither was seen again.

Hedymeles ludovicianus.* ROSE-BREADED GROSBK.—As in other pursuits, chance seems at times to play an important rôle in bird study. Returning to Grande Grève for an hour from camp at Haldimand on Sept. 27 1941, I found an adult male rose-breast feeding on mountain ash berries in our dooryard.

Although this is believed to be the first Gaspé record, it was reported by Schmitt (1904) on Anticosti, verified by Dionne (cf. Braund and McCullagh, *Wilson Bull.* 52(2): 119, 1940). Dr. R. G. Van Name tells me of seeing a male in the spring of 1915 or 1916 near the Bay of Isles, Newfoundland.

Spiza americana.* DICKCISSEL.—A late straggler to the Northeastern Coast was observed closely from 9.55-10.30, October 18, 1940, about a mile west of Cape Gaspé. With a small flock of tree sparrows, it fed on chickweed seeds at the roadside. Unafraid, it allowed me to follow it about at a distance of 15 feet, a much closer approach than the sparrows permitted. Careful sketches identify it, in all probability, as an immature male. Lacking means for taking the specimen, I returned later with a gun. Search was then in vain, nor was it seen in the days following. Its ground note was a strong "quip"; flight call, "quirtt".

This is the first dickcissel recorded from Gaspé, but C. E. Dionne (*Liste des Oiseaux de l'Île d'Anticosti*, *Nat. Canadien* 47:25-29.

1920) reports one found dead there by Mr. Willie La Brie.

Acanthis linaria. RED-POLLED LINNET.—On October 20, 1940, the first flock of about 30 appeared at Grande Grève. Seen daily up to the 28th when I left Gaspé; total about 335. In 1941 migrants in flocks of as many as 50 were noted from Oct. 24 to Nov. 4. One taken on Nov. 29 was of the common race, as were all others, as far as I could observe.

Loxia recurvirostra.* RED CROSSBILL.—One, of undetermined race, flew wildly from tree to tree at Grande Grève as though lost. Hurdledly seizing a gun, I neglected to take the binoculars, and could not come within gunshot. The first view, however, had determined it as a female or immature bird. Its loud, sharp, whistled call consisted of two short notes followed by a longer one, slightly lower and more vibrant.

Spizella arborea.* TREE SPARROW.—First seen Oct. 4, 1940, at Haldimand, increased in numbers up to 100 per day at Grande Grève by the 21st, declining thereafter. In 1941 they came to Haldimand one day earlier—5, Oct. 3rd; 10, Oct. 5th.

Zonotrichia leucophrys.* WHITE-CROWNED SPARROW.—One on Sept. 20, 1940; and 1, 6, 2, 18, 1, 20 on Oct. 4, 12, 13, 14, 21, and 27 respectively. In 1941 an adult appeared with an immature on Sept. 28. Not more than 10 others, all immature, were seen before I left on Nov. 5.

Passerella iliaca.* FOX SPARROW.—Common fall migrant in 1940. Appearing first on Sept. 30, the numbers increased to a maximum of 100 on October 12, then fell to 9 on the 26th, the last ones seen. Practically all were on the Forillon. Uncommon in 1941, the first on Oct. 9, a few feeding at oat-cocks in 8 inches of snow Oct. 12th, and not over 25 more scattered through the rest of the month, the last one on Oct. 27th.

Not found breeding in Northeastern Gaspé, but has been reported nesting on Anticosti by Verrill 1862, Brewster 1881 (abundant at Fox Bay), Schmitt, and Dionne. Brooks and Lewis have found it common at Ellis Bay. Along the southern shore of Labrador also Brewster found it everywhere in late spring. Perhaps migrants reach the Forillon from Anticosti. Although none has been seen entering the little peninsula from the west, several flocks have been followed out of it toward the west.

Melospiza georgiana.* SWAMP SPARROW.—Uncommon migrant. One immature killed by cat Sept. 18th (preserved), one seen at Little Gaspé Aug. 29th, and another at the very tip of the Forillon Oct. 21, 1940. Two in fall of 1941. Breeds both north and south of Gaspé.

Plectrophenax nivalis. SNOW BUNTING.—Common after Oct. 20th, the date of first appearance in both 1940 and 1941. The numbers were much greater in the latter year. Flocks of 300 or more were so conspicuous on the Forillon and all about Gaspé Bay as to be remarked upon by the residents. Two great flocks were seen Nov. 6, 1941, between Ste. Anne des Monts and Quebec City.

NOTES ON THE PLANARIAN FAUNA OF CANADA

By ROMAN KENK

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THE AUTHOR received from the Museum of Zoology of the University of Michigan several samples of unidentified planarians or fresh-water triclads, collected in 1899 by Professor Jacob E. Reighard¹ in Lake Erie along both the American and Canadian shores. At the same time he obtained, through the courtesy of Dr. Charles W. Creaser, living specimens of triclads collected by Miss Jessie L. Metcalf (Wayne University) in a spring near Benmiller, Ontario.

Canada is practically unexplored with regard to its planarian fauna. A survey of the pertinent literature revealed that several limnological workers in the Dominion came across planarians in the course of their studies, but that little attempt was made to secure identifications of the animals.

The first authors to report a fresh-water triclad from Canada were S. I. Smith and A. S. Verrill (1871: 452; Smith, 1874: 700, 706), who dredged *Procotyla fluviatilis* in Lake Superior, on the south side of Saint Ignace Island, from a depth of 4 to 13 fathoms. Ward (1894: 50) states that *Planaria maculata* (*Dugesia tigrina*) was found in Lake St. Clair, but fails to indicate the exact locality, whether near the shores of Michigan or of Ontario. Huntsman (1913: 279) reports that "planarians" are abundant in the waters of the Toronto region, Ontario. Adamstone (1924) found "Platyhelminthes", presumably planarians, among the bottom fauna of Lake Nipigon, Ontario, at depths varying from 72 to 321 feet. A white planarian, *Planaria morgani* (*Phagocata morgani*) was observed by Arndt (1924: 244-245) to be very abundant in small streams in the gorge below Niagara Falls, on both the American and the Canadian sides. Rawson (1930: 33, 70) collected a planarian, "probably *Planaria maculata*" (*Dugesia tigrina*), in various parts of Lake Simcoe, Ontario. Unidentified triclads were reported by several authors from Canadian territory: by Cronk (1932: 55), from Shakespeare Island Lake, on Shakespeare Island, Lake Nipigon, Ontario; by Ricker (1932: 141, 154, 158), from a pond and two lakes in Ontario; by Ricker (1934: 18, 100), from a creek and a river in Ontario; and by Rawson (1934), from lakes of the Kamloops region, British Columbia.

In the collections of Reighard and of Metcalf at least four species are represented, of which two are new to Canada. Reighard's material contains, unfortunately, no sexually mature animals. This made it difficult to identify the specimens with certainty, except for a few which showed other characteristic structures or which had the external shape unusually well preserved.

Curtisia foremani (Girard)

Nine individuals of this species were collected by Miss Jessie L. Metcalf in a spring near Benmiller, Huron County, Ontario, October 26, November 2, and November 25, 1940. Six of the animals were sexually mature. In the same locality *Phagocata velata* also occurred.

Curtisia foremani is a typical inhabitant of cool streams and is distributed in the United States from the Atlantic coast west to Michigan. It is new to Canada.

Dugesia tigrina (Girard)

To this species I refer one sample in Reighard's material, collected at Long Point, Ontario, August 18, 1899—ten specimens, all immature, with retracted, but visible, auricular appendages. The species has a wide range of distribution in the United States, from the Atlantic to the Pacific coast.

Phagocata velata (Stringer)

Four specimens of *Phagocata velata* were taken by Miss Metcalf near Benmiller, Huron County, Ontario, in the same spring in which *Curtisia foremani* was collected, November 2, 1940 (three animals, two of them sexually mature) and November 25, 1940 (one asexual specimen). The species generally occurs in springs and spring-fed creeks. It has been reported from several states in the Middle West (from Michigan west to Nebraska), but not from Canada.

Phagocata velata is rarely found sexually mature in nature. However, it seems that lots from different localities show a different tendency to develop reproductive organs. Commonly the species reproduces agamically, by multiple fission (fragmentation), followed by a reorganization of the fission pieces in cysts formed by hardened mucus. Sexual animals have been found in only a few localities in Indiana, Missouri, and Michigan, usually in the cold season of the year. The high incidence of sexuality in the Benmiller material (50%), though statistically not significant on account of the small number of animals examined, is nevertheless worth mentioning.

Procotyla fluviatilis Leidy

One immature specimen was collected by J. E. Reighard at Rondeau Harbor, Kent County, Ontario, August 28, 1899, "from East Swamp". The presence of an anterior adhesive organ and the anatomy of the pharynx made it possible to identify the species.

Procotyla fluviatilis occurs in the United States from New England west to Wisconsin.

DISCUSSION

The four species reported in this paper, and *Phagocata morgani* found by Arndt at Niagara Falls, are all widely distributed in the

¹ See Rep. U. S. Comm. Fish and Fisheries for the year ending June 30, 1900, p. 19.

United States. This is not surprising, considering the fact that all the localities where they were collected in Canada lie along the southern boundary of the Dominion. It is also highly probable that the planarian fauna of Canada is mainly an impoverished American fauna. The entire territory of Canada was covered by ice sheets in recent geological time. We may assume that practically all the preglacial fresh-water fauna of Canada perished during the glacial periods, and that, after the retreat of the glaciers, the waters were gradually populated by southern species migrating to the north. The same conditions may be observed in the distribution of planarians in Europe.

Generally speaking, the planarians have attained their greatest development in the north temperate zone. Toward the North Pole as well as toward the Equator, the planarian fauna becomes less and less diversified. It is to be considered, however, that so far only Europe and to a lesser degree North America, Asia, and Australia, have been sufficiently studied to permit general zoogeographical conclusions.

The scheme of distribution of fresh-water triclads in the Northern Hemisphere is somewhat obscured by the development of rich endemic faunas under exceptional conditions which facilitated the survival of old species during the perturbations of recent geological periods. This has apparently occurred in deep ancient lakes, such as Lake Baikal in Siberia and Lake Ohrid in the Balkan Peninsula. Representatives of an older fauna may also have survived in subterranean habitats (caves, etc.), as we may conclude from the distribution of planarians in well-explored regions (Europe) and from the fact that frequently cave planarians can not be derived from any species now living in surface waters (deBeauchamp, 1932).

In view of these circumstances, we may not expect to find in Canada a planarian fauna appreciably different from that of the United States. The Canadian lakes are of too recent origin to have evolved a peculiar fauna. On the other hand, it is possible that endemic species with limited geographic ranges will be found in caves and similar habitats.

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A PRELIMINARY LIST OF LATE CAMBRIAN TRILOBITES FOUND ON THE WEST COAST OF NEWFOUNDLAND

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THIS PAPER is a preliminary account of the discovery of late Upper Cambrian trilobites at two localities in Newfoundland. The trilobite genera are listed but not specifically identified, and are correlated with those of the Upper Cambrian boulders at Levis, Quebec and of the Gorge formation in northern Vermont.

During the summers of 1938 and 1939 the writer had the pleasure of working on the west coast of Newfoundland for the Geological Survey of Newfoundland. The purpose of this work was to geologically map areas where it was hoped there might be oil possibilities. The other geologist, and leader of the party, was Dr. Helgi Johnson who had had several years' experience in mapping that region. When we started in to map the area of St. Paul's Inlet in 1938 the prospect for fossil collecting was not very bright. The area previously mapped by Dr. Johnson had yielded few specimens, and Schuchert and Dunbar's *Stratigraphy of Western Newfoundland* records only one graptolite and one gastropod locality in St. Paul's Inlet. Nevertheless, Cow Head is located close by, and in the hope of getting a good collection from there the writer carried what seemed to be an abundant supply of collecting bags and wrapping paper.

When mapping began, rich graptolite faunas were discovered, and our supply of paper was rapidly exhausted. The abundance of graptolites was not entirely satisfactory for another reason; the writer's prayer was for trilobites, and only one was found (Kindle, 1942). Toward the close of the work in this region, however, it was necessary to map the location of a limestone-conglomerate outcrop on the north side of the channel between the entrance and the narrows of St. Paul's Inlet. Here a couple of boulders containing numerous small trilobites were found in the conglomerate (or breccia). At the time we assumed these to be well-known forms, but now find they represent a stratigraphic zone hitherto unrecognized in Newfoundland.

Later in the season we mapped Western Brook Pond, and here again collected many graptolites. To reach this lake we carried our equipment several miles over a marsh or bog. On returning, and while the boat was being made ready, the writer examined the limestone conglomerates at Martin's Point. These strata were reputed to contain no fossils. Nevertheless, about half-way out on this quarter-mile promontory he chanced to see one boulder, about ten inches in diameter, which to his joy was crowded with trilobites. Disregarding shouts from the remainder of the party that they were ready to leave, he extracted this precious find. A hurried search

on the way back to the boat disclosed no more like it.

En route to Port Saunders brief opportunities were seized to collect trilobites at Table Head and from the following stages and localities near Cow Head,—the early Upper Cambrian on the northwest side of Cow Head, the lowest Ordovician on the northwest side of Stearing Island, younger trilobites of Table Head age from the southeast side of Stearing Island and from Lower Head about four miles north of Cow Head, where they occur abundantly in a white limestone.

By now our fossil collection had reached formidable proportions, and afforded considerable ballast for the boat. When we started the season's work I had expected to look after all the fossils, while Dr. Johnson put his main energy on stratigraphy and structure. The vast amount of fossils collected, however, was obviously beyond the capacity of one man, particularly one who has a position at City College where the facilities and time for research are limited. We agreed to split them between us, Dr. Johnson undertaking to study the graptolites, while the trilobites went to the writer (except those Lower Cambrian specimens whose discovery had been anticipated by Professor Howell). This arrangement has proved quite satisfactory. There were, to be sure, some collections that were sent to specialists in other fields, such as plant fossils collected later that same season at Conche.

Most of the 1939 season was spent in mapping the coastal region between Port Saunders and Parson's Pond. For the writer the highlight of this season was the opportunity to get more trilobites in the Table Head region. Our specimens are good enough to warrant reillustrating many of the trilobites of the Table Head limestone.

Another bright spot in the summer's collecting came at the close of a day's trip up the Southwest Feeder of Portland Creek Pond. On returning to our canoe near the mouth of the Feeder, Frank Perry of Port Saunders and I examined the cut bank of clay and silt which rose about ten feet above the stream, and discovered a rich deposit of Pleistocene shells, among which were numerous specimens of a brachiopod. Our collection has since been studied by Dr. H. G. Richards (1940), and the brachiopod identified as *Rhynchonella psittacea*. It is the collection which he calls no. 3 (Johnson) and, containing 17 different species not counting the foraminifera which could be seen in the silt, is the largest collection he lists in his paper. The writer was very interested in this first Pleistocene brachiopod he had seen but later discovered it has been known for a long time; for Billings illustrated a specimen from Beauport near Quebec City in the first

volume of the Canadian Naturalist and Geologist in 1856.

But returning to trilobite collections, those of the Table Head limestone are now cleaned, identified for the most part, and ready to be used to illustrate more fully the structure of described species. There are also among them a few new species. The same can be said for those of early Upper Cambrian age from Cow Head.

The age of those trilobites from the entrance to St. Paul's Inlet and from Martin's Point was not discovered until recently. In studying trilobites from Highgate Falls, Vermont, a resemblance was noticed between some species from the Gorge formation and some from Newfoundland. *Apatakephaloides clivosus* Raymond and *Phylacterus saylesi* Raymond from Vermont look very similar to specimens from St. Paul's Inlet. In addition I have in my own collection from the Gorge formation specimens of an undescribed species of a new genus which closely resemble certain specimens from St. Paul's. A preliminary list of trilobite genera from the entrance to St. Paul's Inlet is as follows:

Apatakephaloides (cf. *A. clivosus* Raymond)
Corbinia?
Distazeris?
Etrathiella?
Idiomesus
Onchonotus?
Phylacterus (cf. *P. saylesi* Raymond)
Plethometopus
Protapatokephalus?
 new genus (similar to specimen from the Gorge formation)

From the boulder collected at Martin's Point we secured,—

Agnostus (cf. *A. rudis holmi* Westergard)
Pseudagnostus (aff. *P. cyclopyge* (Tullberg))
Plethagnostus?
Hardyia?
Hungaia (aff. *H. magnifica* (Billings))
Keithia (aff. *K. subclavata* (Billings))
Leptoplastus?
Liostracinoides?
Onchonotus
Phylacterus?
Richardsonella?
Solenopleura?
Tostonia?

The trilobites from the Martin's Point boulder are different from those of St. Paul's,

though probably of about the same age. The *Hungaia* is probably a new species, closely allied to *H. magnifica* (Billings), and a new species of *Keithia* is closely allied to *K. subclavata* (Billings). These two species of Billings were collected at Levis, Quebec, from late Upper Cambrian boulders, which Clark (1924) has shown to be of about the same age as the Gorge formation.

So it appears, while the Martin's Point boulder is clearly related to the Upper Cambrian boulders of Levis; the ones at the entrance to St. Paul's Inlet are clearly related to the Gorge formation of Vermont. But the Levis and the Gorge faunas have been shown to be equivalent, Clark listing three species common to the two places, and this number has been increased by Raymond's (1924, 1937) work on the Gorge fauna. This correlation is further strengthened by the writer's finding in the Gorge formation a species described by Billings as *Conocephalites zenkeri*. Accordingly, while most of the specimens are new species, and indeed many of the genera are doubtfully named, it is reasonably certain that the boulders from the entrance to St. Paul's Inlet and from Martin's Point are of late Upper Cambrian age. They are best correlated with boulders at Levis, Quebec, and with the Gorge formation of Vermont.

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THE SPIDERS OF THE LAKE NIPISSING AND LAKE TEMAGAMI REGIONS, ONTARIO¹

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THE PRESENT LIST is a contribution towards the zoogeographical study of spiders, a group relatively neglected in Ontario. Although arachnological faunal lists have appeared for a few areas, viz., York County, Prince Edward County and Mer Bleue (near Ottawa), it is yet too early to generalize concerning the distribution of our spiders. Much collecting, especially of the minute species, remains to be done. Anyone interested in furthering this work may obtain directions by corresponding with the writer at the Royal Ontario Museum of Zoology, 100 Queen's Park, Toronto, Ontario.

The specimens reported herein came from the following localities:

I—Lake Nipissing Region

- (a) Near the source of the French River.
Franks Bay, Parry Sound District.
Bass Creek, Parry Sound District.
Campbell's Bay, Parry Sound District.
Blueberry Island, Nipissing District.
- (b) Miscellaneous
North Bay, Nipissing District.
West Bay, Nipissing District.
Goose Island, Nipissing District.

II—Lake Temagami region—which lies entirely in the Nipissing District.

- (a) Islands of Lake Temagami
Nos. 315, 574, 843, 964 (Bear Island),
1008, 1009, 1010, 1012, 1024, 1025,
1026, 1027, 1028, 1029, 1033, 1035,
1036, 1037.
- (b) On the mainland shore of Lake Temagami
Temagami Village.
Sand Point.
Kokoko Bay.
- (c) Miscellaneous
Tomiko River.
Lowell Lake.

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DESCRIPTION OF THE AREA

Lake Nipissing lies 200 miles north of Toronto, Lake Temagami 70 miles farther north. Both are on the precambrian shield in longitude 80°W. and latitude 46-47°N. The outcrops are predominantly granite.

The area has a mean annual temperature of approximately 40°F. Its summer isotherm

falls between 60° and 65°F. The country is heavily wooded. The original pine forest has been largely cleared off in the Nipissing region but has been preserved to a greater extent in the Temagami region. Both regions lie within the Great Lakes-St. Lawrence Forest region. While white and red pine have been the characteristic trees in the past, more recently they have dwindled in the Nipissing region due to lumbering. Birches and poplars are important. Some hardwood, especially red oak and white elm, are common at Lake Nipissing but rare or absent at Lake Temagami. Both regions fall in the Canadian Zone of Merriam.

ULOBORIDAE

Hyptiotes cavatus Hentz.

Lake Temagami, Lowell Lake: Aug. 21, 1937; 1 ♀.

Uloborus americanus Walck.

Lake Nipissing, Franks Bay, July 26, 1931.

DICTYNIDAE

Amurobius bennetti Blackw.

Lake Nipissing, Franks Bay: July 26, 1931; 1 imm., 7 ♀.

Lake Temagami, Lowell Lake: Aug. 8, 1937; 2 ♀; Village, Aug. 8, 1937; 9 ♀; Island 1036: July 26, 1937; 4 imm., 1 ♂, 3 ♀; Island 1029: July 24, 1937; 3 ♀; Island 574: Sept. 1, 1938; 1 ♀.

A. borealis Em.

Lake Nipissing, Franks Bay: July 26, 1931, 2 imm., 1 ♀.

A. tibialis Em.

Lake Temagami, Island 1024: June 16, 1937, 2 ♀.

Dictyna brevitaris Em.

Lake Nipissing, Franks Bay: July 26, 1931, 1 ♀.

Lake Temagami, Lowell Lake: Aug. 21, 1937, 1 ♀.

D. maxima Bks.

Lake Temagami, Island 315: August, 1933.

D. minuta Em.

Lake Temagami, Sand Point, mainland: July 27, 1938, 1 ♀.

D. pallida Keys.

Lake Nipissing, North Bay: Aug. 15, 1930, 1 ♀.

D. phylax Gertsch and Ivie

Lake Temagami, Tomiko River: Aug. 12, 1937, 1 ♀.

D. sublata Hentz.

Lake Temagami, Lowell Lake: Aug. 12, 1937, 1 ♀.

D. vigilans Gertsch and Ivie

Lake Temagami, Lowell Lake: Aug. 8, 1939; 1 ♀.

DRASSIDAE

Callilepes imbecilla Keys.

Lake Nipissing, Franks Bay: July 26, 1931, 2 imm., 2 ♀.

¹ Received for publication, November 21, 1942.

Drassodes neglectus Keys.

Lake Nipissing, Blueberry Island: June 27, 1929; 1 ♂; Franks Bay: July 26, 1931; 8 ♀.

Gnaphosa gigantea Keys.

Lake Nipissing, Franks Bay: June 4, 1930; 1 ♂, 1 ♀; July 26, 1931; 6 ♀.

G. parvula Bks.

Lake Nipissing, Franks Bay: July 30, 1931; 1 ♀.

Herpyllus varsifer Walck.

Lake Nipissing, Franks Bay: June 4, 1931; 1 ♀; Aug. 4, 1931; 1 ♀.

Sergiulus montanus Em.

Lake Nipissing, Franks Bay: July 26, 1931, 2 ♀.

S. variegatus Hentz.

Lake Nipissing, West Bay: July 15, 1930; 1 ♀.

Zelotes ater Hentz.

Lake Temagami, Lowell Lake: Aug. 7, 1937; 2 ♀; Island 1025, July 12, 1937; 1 ♀; Island 1027: June 10, 1937; 4 imm., 1 ♀; Island 1008: July 1, 1937; 1 ♀.

Z. depressus Em.

Lake Nipissing, Franks Bay: July 26, 1931, 2 ♀.

THERIDIIDAE

Dipoena nigra Em.

Lake Nipissing, Franks Bay: July 26, 1931, 3 ♀.

Pedanothes riparius Keys.

Lake Temagami, Island 574: Sept. 1, 1938; 1 ♀.

Rhomphaea feticulum Hentz.

Lake Temagami, Lowell Lake: Aug. 20, 1937, 1 imm.

Steatoda borealis Hentz.

Lake Nipissing, Franks Bay: Sept. 14, 1929; 2 ♀; July 26, 1937: 1 imm., 1 ♀.

Lake Temagami, Island 315: August, 1933; 1 ♀. Lowell Lake: Aug. 8, 1937; 3 imm.; Village: Aug. 9, 1937; 1 imm.

Theridion differens Em.

Lake Temagami, Island 843: June 14, 1937; 1 ♀; Island 1036: July 23, 1937, 2 ♀; Island 1010: July 12, 1937, 2 ♀; Lowell Lake: Aug. 8-21, 1937, 1 imm., 1 ♀.

T. frondeum Hentz.

Lake Nipissing, Goose Island: June 24, 1930, 1 ♂; West Bay: July 11, 1930, 1 ♂.

T. zelotypum Em.

Lake Nipissing, Franks Bay: July 26, 1931, 4 imm., 6 ♀.

Theridula opulenta Walck.

Lake Temagami, Island 1024: June 14-22, 1937, 1 imm., 2 ♂, 2 ♀; Bear Island: June 30, 1937, 1 ♀; Lowell Lake: Aug. 21, 1937, 1 ♀.

LINYPHIIDAE

Bathypantes subalpinus Em.

Lake Temagami, Island 315: Aug. 1933, 1 ♀.

Ceraticelus emertoni Camb.

Lake Temagami, Island 1012: July 9, 1937, 1 ♀; Tomiko River: Aug. 7, 1937, 1 ♂, 1 ♀; Lowell Lake: Aug. 21, 1937, 1 ♀.

C. fissiceps Camb.

Lake Temagami, Lowell Lake: Aug. 8-21, 1937.

C. formosus Bks.

Lake Nipissing, Franks Bay: July 31, 1931, 1 ♀.

C. laetabilis Camb.

Lake Nipissing, Franks Bay: July 28, 1931, 1 ♀.

Lake Temagami, Island 1024: June 16, 1937, 2 ♀; Mainland, N.W. of Island 1033: July 28, 1937, 1 ♀.

Ceratinopsis interpres Camb.

Lake Nipissing, Franks Bay: July 26, 1931, 4 ♀.

Diplocephalus arenarius Em.

Lake Nipissing; June 29, 1929, 1 ♀.

D. minutus Em.

Lake Nipissing, Franks Bay: July 26, 1931, 1 ♀.

Dismodicus decemoculatus Em.

Lake Nipissing, Goose Island: July 5, 1931, 28 imm.

Lake Temagami, Island 1029, July 19-24, 1937, 2 ♀.

Drapetisca socialis Sund.

Lake Temagami, Island 1035; July 27, 1937, 2 imm.

Erigone longipalpis Sund.

Lake Nipissing, Franks Bay: July 26, 1931, 1 ♂.

Grammonota pictilis Camb.

Lake Temagami, Lowell Lake: Aug. 21, 1937, 3 imm., 2 ♀.

Hypselistes florens Camb.

Lake Nipissing, Franks Bay: July 26, 1931, 4 ♀.

Lake Temagami, Lowell Lake: Aug. 8, 1937, 11 imm.

Linyphia communis Hentz.

Lake Temagami, Tomiko River: Aug. 7, 1937, 24 imm.; Village: Aug. 8, 1937, 1 imm.; Lowell Lake: Aug. 21, 1937, 5 imm.

L. insignis Blackw.

Lake Nipissing, Franks Bay: July 29, 1931, 11 imm.

Lake Temagami, Island 315: Aug., 1933, 1 ♀; Tomiko River: Aug. 7, 1937, 2 imm.; Lowell Lake: Aug. 21, 1937, 7 imm.

L. limitanea Em.

Lake Nipissing, Franks Bay: July 29, 1931, 1 ♂, 17 ♀.

L. marginata C. Koch

Lake Nipissing, Franks Bay: June 23, 1929, 1 ♀; July 26, 1931, 1 imm., 1 ♂, 5 ♀.

Lake Temagami, Island 1024: June 14-22, 1937, 3 imm., 4 ♂, 3 ♀; Island 1036: July 1, 1937, 4 imm. Island 1028: July 19, 1937, 1 ♀; Lowell Lake: Aug. 8-23, 1937, 55 imm., 1 ♀.

L. phrygiana C. Koch.

Lake Nipissing, Franks Bay: July 26, 1931, 65 imm., 1 ♂, 15 ♀.

Lake Temagami, Island 315: Aug., 1933, 1 ♀, 5 imm.; Tomiko River: Aug. 7, 1937, 2 imm.; Lowell Lake: Aug. 8-21, 1937, 11 imm.

ARGIOPIDAE

Araneus angulatus Cl.

Lake Temagami, Island 315: Aug., 1933, 7 ♀.

- A. arabescus* Walck.
 Lake Nipissing, Goose Island: July 26, 1931, 2 ♂, 2 ♀.
 Lake Temagami, Tomiko River: Aug. 7, 1937; 1 ♀; Island 1030: July 28, 1938, 1 ♀.
- A. corticarius* Em.
 Lake Temagami, Island 315: Aug., 1933, 3 imm.
- Araneus cucurbitinus* Cl.
 Lake Nipissing, Franks Bay: Aug. 1, 1931, 5 imm.
 Lake Temagami, Tomiko River: Aug. 7, 1937, 1 imm.; Lowell Lake: Aug. 21, 1937, 1 imm.
- A. marmoreus* Cl.
 Lake Nipissing, Franks Bay: July 26, 1931, 3 ♀.
 Lake Temagami, Island 315: Aug., 1933, 2 ♀.
- A. montanus* C. Koch.
 Lake Nipissing, Franks Bay: July 26, 1931, 3 ♀.
 Lake Temagami, Island 315: Aug., 1933, 2 ♀.
- A. nordmanni* Thorell.
 Lake Temagami, Kokoko Bay: Aug. 20, 1937, 1 ♀.
- A. patagiatus* Cl.
 Lake Nipissing, Franks Bay: June 9-14, 1929, 4 ♀; Goose Island: June 12-July 4, 1929, 3 imm., 5 ♀.
 Lake Temagami, Sand Point: July 27, 1938, 1 ♂.
- A. sericatus* Cl.
 Lake Nipissing, Franks Bay: Aug. 1, 1931, 1 ♂, 1 ♀.
- A. trifolium* Hentz.
 Lake Nipissing, Franks Bay: Sept., 1929, 1 ♀; July 26, 1931, 1 ♀; July 26, 1932, 1 ♂.
- Cyclosa conica* Pallas.
 Lake Temagami, Island 315: Aug., 1933, 3 imm.; Island 1027: June 27, 1937, 2 ♂; Tomiko River: Aug. 7, 1937, 1 imm.
- Eustala anastera* Walck.
 Lake Temagami, Tomiko River: Aug. 7, 1937, 1 imm.; Lowell Lake: Aug. 8-21, 1937, 3 imm.
- Mangora placida* Hentz.
 Lake Nipissing, Franks Bay: July 28, 1931, 1 ♀.
 Lake Temagami, Lowell Lake: Aug. 8-21, 1937, 18 imm.
- Tetragnatha elongata* Walck.
 Lake Nipissing, Franks Bay: June 29, 1930, 2 ♂; July 26, 1931, 1 ♀.
 Lake Temagami, Island 1009: June 24, 1937, 1 ♂, 1 ♀; Island 843: June 30, 1937, 1 ♂; July 14, 1937, 1 ♂.
- T. extensar* L.
 Lake Nipissing, Franks Bay: July 31, 1929, 1 ♀; Goose Island: June 22, 1930, 1 ♀; June 29, 1930, 1 ♂; Aug. 1, 1931, 5 ♂, 22 ♀.
- T. laboriosa* Hentz.
 Lake Nipissing, Franks Bay: June 29, 1930, 1 ♂, 1 ♀; Goose Island: June 18, 1930, 1 ♀, 2 imm.; July 26, 1931, 2 imm., 1 ♀.
 Lake Temagami, Lowell Lake: Aug. 22, 1937, 1 imm.
- T. pallescens* Camb.
 Lake Nipissing, Goose Island: July 26, 1931, 1 ♂, 3 ♀.
- T. straminea* Em.
 Lake Nipissing, Franks Bay: July 4 1930, 1 ♂, 4 ♀; Goose Island: Aug. 1, 1931, 1 ♀.
- T. vermiformis* Em.
 Lake Nipissing, Goose Island: July 27, 1931, 2 ♂, 8 ♀.
- MIMETIDAE
- Mimetes intersector* Hentz.
 Lake Temagami, Island 1028: July 19, 1937, 1 imm.
- THOMISIDAE
- Misumena vatia* Cl.
 Lake Nipissing, Franks Bay: Aug. 1, 1931, 1 imm.
 Lake Temagami, Tomiko River: Aug. 7, 1937, 3 imm.; Village: Aug. 8, 1937, 1 imm.
- Oxyptila conspurcata* Thorell?
 Lake Nipissing, Franks Bay: July 26, 1931, 1 imm.
- Philodromus aureolus* Cl.
 Lake Nipissing, Franks Bay: July 14, 1930, 1 ♀.
 Lake Temagami, Island 1026: June 24, 1937, 1 ♂; July 5, 1937, 1 ♀; Island 1037: July 19, 1937, 1 imm.; Island 1009: June 24, 1937, 1 ♂; Tomiko River: Aug. 7, 1937, 1 ♀.
- P. ornatus* Banks.
 Lake Nipissing, Franks Bay: July 29, 1931, 2 imm.
 Lake Temagami, Lowell Lake: Aug. 21, 1937, 1 imm.
- P. pernix* Blackw.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 imm, 1 ♀.
 Lake Temagami, Island 1024: June 22, 1937, 1 ♀.
- P. rufus* Walck.
 Lake Nipissing, Franks Bay: July 26, 1931, 11 imm., 4 ♀.
 Lake Temagami, Island 1035: July 6, 1937, 1 imm.; Village: Aug. 8, 1937, 1 imm.
- Thanatus coloradensis* Keys.
 Lake Nipissing, Franks Bay, June 14, 1932, 1 ♀.
- Tibellus oblongus* Walck.
 Lake Temagami, Island 1024: June 14-22, 1937, 3 ♂, 1 ♀.
- Tmarus angulatus* Walck.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 imm.
- Xysticus brunneus* Banks.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 ♀.
- X. elegans* Keys.
 Lake Temagami, Island 1024: June 14, 1937, 1 ♀.
- X. ferox* Hentz.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 imm.
- X. formosus* Banks.
 Lake Nipissing, Franks Bay: July 27, 1931, 1 ♀.
- CLUBIONIDAE
- Agroeca ornata* Banks.
 Lake Nipissing, Franks Bay: July 26, 1931, 2 ♀.
 Lake Temagami, Island 1036: July 14, 1937, 1 ♀.
- Castaneira cingulata* C. Koch.
 Lake Nipissing, Franks Bay: July 30, 1931, 4 imm., 4 ♀; Aug. 30, 1934, 1 ♂.

- Lake Temagami, Island 1037: July 14, 1937, 1 imm.
C. descripta Hentz.
 Lake Nipissing, Franks Bay: July 31, 1931, 1 ♂, 5 ♀.
C. longipalpus Hentz.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 imm.
 Lake Temagami, Lowell Lake: Aug. 21, 1937, 1 ♀.
Clubiona canadensis Em.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 imm.
 Lake Temagami, Lowell Lake: Aug. 21, 1937, 1 ♀.
C. obesa Hentz.
 Lake Nipissing, Franks Bay: July 26, 1931, 1 ♀.
C. obtusa Em.
 Lake Temagami, Village: Aug. 8, 1937, 1 ♀.
C. pallens Hentz.
 Lake Nipissing, Franks Bay: July 24, 1929, 1 imm.; July 26-31, 1931, 1 imm., 1 ♂, 3 ♀.
C. riparia L. Koch.
 Lake Nipissing, Franks Bay: July 28, 1937, 4 ♀.
Micaria aurata Hentz.
 Lake Nipissing, Franks Bay: July 26, 1931, 7 ♂ 2 ♀.
M. gentilis Banks.
 Lake Nipissing, Franks Bay: July 31, 1931, 1 imm.

AGELENIDAE

- Agelena naevia* Walck.
 Lake Nipissing, Franks Bay: July 11, 1930, 4 imm.; July 26, 1931, 3 ♂, 2 ♀; July 21, 1933, 1 ♀.
Cicurina brevis Em.
 Lake Temagami, Island 1024: June 22, 1937 1 ♀.
Coelotes fidelis Banks.
 Lake Nipissing, Franks Bay: Aug. 1, 1931, 1 imm.
 Lake Temagami, Island 315: Aug. 19, 1933, 1 imm.; Lowell Lake: Aug. 23, 1937, 1 ♀.
Coelotes montanus Em.
 Lake Temagami, Island 315: Aug., 1933, 1 ♀; Island 1024: July 15, 1937, 1 ♀.
Hahnina agilis Keys.
 Lake Nipissing, Franks Bay: Aug. 18, 1929, 1 ♀.
 Lake Temagami, Lowell Lake: Aug. 23, 1937, 1 ♀.
H. brunnea Em.
 Lake Temagami, Island 1037: July 14, 1937, 1 imm.
H. cinerea Em.
 Lake Temagami, Island 1029: July 24, 1937, 3 ♀.
H. riparia Keys.
 Lake Temagami, Lowell Lake: Aug. 8-21, 1937, 1 ♂, 1 ♀.

PISAUROIDAE

- Dolomedes scriptus* Hentz.
 Lake Nipissing, Franks Bay: July 15, 1929, 1 ♀; Blueberry Island: July 25, 1929, 1 ♀; South Bay: Aug. 21, 1929, 1 ♀; Goose Island: Sept. 16, 1929, 1 imm.; Bass Creek: Aug. 8, 1931, 1 ♀; Franks Bay: July 26, 1931, 3 ♀; Aug. 18, 1931, 1 ♀.
D. triton secpunctatus Hentz.
 Lake Nipissing, Bass Creek: July 31, 1930,

1 ♀; Sept. 3, 1930, 2 imm.; Campbell Bay: July 31, 1930, 1 imm.

D. tenebrosus Hentz.

Lake Nipissing, Franks Bay: July 26, 1931, 3 imm.

Pisaurina mira Walck.

Lake Nipissing, Franks Bay: July 26, 1931, 4 imm.

LYCOSIDAE

Alouecosa beanii Em.

Lake Nipissing, Franks Bay: July 26, 1931, 2 ♀; June 23, 1934, 1 ♀.

Lycosa avara Keys.

Lake Nipissing, Franks Bay: July 26, 1931, 2 ♀; Aug. 1, 1934, 1 ♀.

L. avida Walck.

Lake Nipissing, Franks Bay: July 26, 1931, 18 ♀.

L. frondicola Em.

Lake Nipissing, Franks Bay: July 5, 1930, 1 ♀; July 26, 1931, 4 ♀.

Lake Temagami, Island 1024: June 14, 1937, 1 ♀; Lowell Lake: Aug. 21, 1937, 1 ♂.

L. pratensis Em.

Lake Nipissing, Franks Bay: June 14, 1930, 1 ♀; July 5, 1930, 1 ♀; West Bay: July 14, 1930, 1 ♀.

Lake Temagami, Island 1024: June 14-24, 1937, 3 ♀; Island 1036: July 26, 1937, 1 ♀.

Pardosa distincta Blackw.

Lake Nipissing, Franks Bay: July 5, 1930, 1 ♀.

Lake Temagami, Island 1016: July 12, 1937, 1 ♀.

P. groenlandica Thorell.

Lake Nipissing, Franks Bay: Sept. 11, 1929, 3 imm.; July 5, 1930, 1 imm.

P. lapidicina Em.

Lake Nipissing, Franks Bay: June-July, 1931, 2 ♀; 1930: July 26, 1931; 7 ♀; July 22, 1934, 1 ♂, 1 ♀.

Lake Temagami, Island 1036: July 27, 1937, 2 ♀; Island 1009: June 24, 1937, 1 ♂; Island 1028: July 19, 1937, 1 ♀; Island 1012: July 9, 1937, 1 ♂, 1 ♀.

P. mackenziana Keys.

Lake Nipissing, Franks Bay: July 26, 1931, 3 ♀.

Lake Temagami, Village: Aug. 9, 1937, 15 ♀; Lowell Lake: Aug. 21, 1937, 22 ♀.

P. modica Blackw.

Lake Nipissing, Franks Bay: Sept. 11, 1929, 4 imm.

P. moesta Banks

Lake Temagami, Tomiko River: Aug. 7, 1937, 1 ♀; Lowell Lake: Aug. 21, 1937, 3 ♀.

P. sternalis Thorell.

Lake Nipissing, Franks Bay: June 29, 1930, 1 ♀.

Lake Temagami, Island 1024: June 14, 1937, 1 ♀; Lowell Lake: Aug. 21, 1937, 2 ♀.

P. xerampelina Keys.

Lake Nipissing, Franks Bay: June 9, 1929, 1 ♀; July 26, 1931, 3 ♀.

Lake Temagami, Island 1060: July 2, 1937, 1 ♂; Island 1035: July 12, 1937; 1 ♀; Village: Aug. 9, 1937, 1 ♀; Lowell Lake: Aug. 21, 1937, 2 imm.

Pirata arenicola Em.

Lake Nipissing, Franks Bay: June 13, 1929, 1 imm.

Lake Temagami, Lowell Lake: Aug. 8, 1937, 1 ♀.

P. insularis Em.

Lake Temagami, Lowell Lake: Aug. 21, 1937, 13 ♀.

P. minutus Em.

Lake Temagami, Island 1024: June 14, 1937, 1 ♀; Lowell Lake: Aug. 21, 1937, 6 ♀.

Schizocosa bilineata Em.

Lake Nipissing, Franks Bay: July 30, 1931, 1 ♀.

S. saltatrix Hentz.

Lake Nipissing, Franks Bay: July 5, 1931, 1 ♀.

SALTICIDAE

Evarcha hoyi Peck.

Lake Nipissing, Franks Bay: July 26, 1931, 1 ♂.

Lake Temagami, Tomiko River: Aug. 7, 1937, 3 imm.; Lowell Lake: Aug. 8, 1937, 1 imm.

Harbrocestum pulex Hentz.

Lake Nipissing, Franks Bay: July 26-Aug. 3, 1931, 3 imm.

Maevia vittata Hentz.

Lake Nipissing, Franks Bay: June 15, 1931, 1 ♂; July 26-Aug. 3, 1931, 3 imm., 2 ♂, 2 ♀.

Metaphidippus capitatus Hentz.

Lake Nipissing, Franks Bay: Aug. 3, 1931, 4 ♀; Goose Island: July 27, 1931, 6 ♀.

Lake Temagami, Island 1024: June 14, 1937, 1 ♂, 1 ♀; Village: Aug. 8, 1937, 1 ♀.

M. flavipedes Peck.

Lake Nipissing, Franks Bay: July 26-Aug. 3, 1931, 8 ♂, 7 ♀.

Lake Temagami, Tomiko River: Aug. 7, 1937, 7 imm., 2 ♂, 6 ♀; Lowell Lake: Aug. 21, 1937, 1 imm., 2 ♂, 1 ♀.

Paraphidippus marginatus Walck.

Lake Nipissing, Franks Bay: July 26, 1931, 5 ♂.

Lake Temagami, Island 1029: July 24, 1937, 4 ♀; Island 1036: July 26-27, 1937, 2 ♀; Island 1024: June 14, 1937, 1 ♀.

Pellenes borealis Banks.

Lake Nipissing, Franks Bay: July 26, 1931, 6 imm., 1 ♀.

Phidippus altanus Gertsch.

Lake Nipissing, Franks Bay: June 1, 1932, 1 ♀.

P. clarus Keys.

Lake Nipissing, Franks Bay: Sept., 1929, 1 ♀.

P. johnsoni Peck.

Lake Temagami, Lowell Lake: Aug. 23, 1937, 1 ♀.

P. purpuratus Keys.

Lake Nipissing, Franks Bay: June 10, 1929, 1 ♀.

Synemosyna formica Hentz.

Lake Nipissing, Franks Bay: July 26, 1931, 1 ♀.

Total number of species=135.

NOTES AND OBSERVATIONS

BIRDS' EGGS COLLECTED BY GEORGE GRIFFIN AT GRAND MANAN, NEW BRUNSWICK.—Dr. Herbert Friedmann of the United States National Museum has recently called my attention to eighteen sets of eggs collected in 1900 by George Griffin at Grand Manan, New Brunswick. These eggs are now in the U.S. National Museum, having been acquired through the late Dr. William L. Ralph who was for many years Curator of Birds' Eggs.

In my paper on the birds of the Grand Manan Archipelago (1939) I compiled a list (pages 310-311) of seventy-four breeding species. Each species was included in this list on the basis of definite breeding records (dates and exact localities where possible). Later, in a short paper, Mr. James Bond (1941, p. 34) added fourteen to this list.

With Dr. Friedmann's permission I am listing below the eighteen sets of eggs above mentioned together with their U.S. National Museum catalogue numbers, dates of collection, and numbers of eggs per set. While this hitherto unpublished information does not extend the total list of breeding species, it gives in several instances either more exact breeding dates (indicated by dagger) or breeding dates earlier in the season (indicated by asterisk).

Hairy Woodpecker (29267), June 2*, 4
Hairy Woodpecker (29471), (no date), 4
Downy Woodpecker (29473), June 12*, 4
Downy Woodpecker (29472), June 21, 4
Alder Flycatcher (29467), June 20*, 3
Barn Swallow (29464), June 13†, 5
Black-capped Chickadee (29463), June 4, 6

Olive-backed Thrush (29468), June 16, 4
Olive-backed Thrush (29469), June 21, 4
Golden-crowned Kinglet (29474), May 22*, 8
Golden-crowned Kinglet (29475), May 26*, 9
Golden-crowned Kinglet (29476), May 30*, 10
Cedar Waxwing (29470), June 13*, 5
Black-throated Green Warbler (29269), June 13, 4
Black-throated Green Warbler (29270), June 16, 5
Red Crossbill (29268), July 7†, 5
Slate-colored Junco (29466), June 3, 4
Chipping Sparrow (29465), June 7†, 5

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Pettingill, Olin Sewall, Jr. 1939. The bird life of the Grand Manan Archipelago. *Proc. New Scot. Inst. Sci.*, 19: 293-372.
—OLIN SEWALL PETTINGILL, JR.,
Carleton College, Northfield, Minn.

SANDHILL CRANES (*Grus canadensis*) IN THE LAKE SUPERIOR REGION OF WESTERN ONTARIO.*—Records of the occurrence of Cranes in Ontario were very few for the last century,

* *Grus canadensis tabida* has come to be very scarce. In the east, southern Michigan is the northern limit of its range. *canadensis* is to my present information and opinion a common migrant through the west. All the birds I have examined from Ontario seem nearer to *canadensis* than to *tabida* including the Beaumaris, Muskoka, bird, and I would expect these eastern wanderers to be the same, although I would not be dogmatic on the subject.—P. A. TAVERNER.

when undoubtedly they were still abundant in the west and, despite a ten-fold increase in the number of observers, I have been unable to find a printed record of their presence in Ontario during the past four decades. In 1908, Nash (*Manual of Vertebrates of Ontario*) described the Sandhill Crane as "An accidental visitor from the western prairies, which has been met with five or six times, in our Province." McIlwraith (*The Birds of Ontario*, ed. 2, 1894, p. 117) gave 3 records: 1862, Kent County, 2 adults and 2 young; 1881, Kent County, 2, one of which was collected for the late Dr. Garnier; 1869, Rondeau, specimen collected by Jno. Oxford and given W. E. Saunders. This specimen is now in the National Museum of Canada. One was shot from a flock of five on September 27, 1892, at Silver Island, District of Thunder Bay, (Atkinson, *G. E., Biol. Rev. Ont.* 1 (4): 97-98, 1894). In the fall of 1872 a pair of cranes was collected at Toronto by Geo. Warren. (*The Natural History of the Toronto Region* ed. by J. H. Faull, 1913). These are in the Royal Ontario Museum of Zoology collection. A pair was seen in 1882 by W. E. Saunders at Mitchell's Bay, St. Clair Flats. There are also reports of its occurrence at Mt. Forest, April, 1893; Milton, 1882; Beaumaris (specimen, N.M.C.); and Trout Lake, Patricia District. The Toronto and Trout Lake records were said to be referable to *canadensis*.

In a personal communication, Mr. Jack Lowcock, Port Arthur, informs me that a

party of duck-hunters which included himself and three fellow-members of the Thunder Bay Field-Naturalists' Club, Messrs. H. Braun, L. Slichter, and C. MacDonald, observed four Sandhill Cranes flying over Whitefish Lake, 50 miles south-west of Fort William, on the evening of September 30, 1939. The evening was stormy but the birds were clearly seen and were heard uttering their loud cry. Apparently these are the first cranes to have been observed in Ontario since those reported from Silver Islet forty-seven years previously.

One can well realize our surprise and pleasure when a pair of cranes were observed near Ouimet Canyon, some 30 miles north-east of Port Arthur, about 7.00 a.m. on September 6, 1941. Accompanied by the Rev. J. K. Brown and James Thompson we were driving slowly along a poor country road on a fishing trip to nearby MacIntosh Lake when Mr. Thompson drew my attention to a pair of large birds standing in a low, 3-acre, field of ripe, uncut hay. They immediately flew past us at a slow rate of speed and were readily identified as *Grus canadensis*.

Since both the above reports are based on sight records, we are unable to state definitely whether these birds were referable to *canadensis* or *tabida*. In both instances the impression favoured *tabida*. In Minnesota the neighboring State to the south, *canadensis* occurs rarely, if at all, whereas *tabida* occurs regularly and nests locally.—A. E. ALLIN, Fort William, Ontario.

BOOK REVIEWS

ORNITHOLOGISTS OF THE UNITED STATES ARMY MEDICAL CORPS; THIRTY-SIX BIOGRAPHIES.

By Edgar Erskine Hume, Colonel. Johns Hopkins Press, Baltimore, Md., 1942. Price \$5.00.

As Alexander Wetmore, Assistant Secretary of the Smithsonian Institution, points out in a foreword, the Army Medical Corps records have been available to the author and so we now find described in one place, both the official activities of these thirty-six men as well as their ornithological studies.

Ornithology in North America is intimately bound up with the United States Army Medical Corps. These men stationed at remote posts collected birds and wrote about ornithology, some of them so extensively that their names are still among the best-known of all that have ever been connected with the science. Their specimens are preserved in the United States National Museum at Washington and are used to this day.

Portraits, cuts showing army posts of ornithological importance, copies of documents, and bird drawings by army ornithologists make up an attractive set of illustrations.

Much of the great interest shown by so many of these officers in ornithology between 1850 and 1860 was inspired by Professor Spencer Fullerton Baird of the Smithsonian Institution. It was one of his original duties to request officers of the army and others to assist in making collections. Baird's wife was

the daughter of the Inspector General of the army, "through whose influence, it has been said, he was able to obtain the services of the youthful medical officers as naturalists and surgeons of the several railway and other expeditions in the west".

This biographical study will prove of great interest to all who study North American ornithology.—HOYES LLOYD.

WILDLIFE OF IDAHO. By William M. Rush. Fish and Game Commission, Boise, Idaho, 1942, 299 pp. Price \$1.00.

In the foreword the Governor of Idaho addresses this book to the boys and girls of the State. I am sure that the wide use of this text among the younger generation will be of great service in telling them what wild life means and how important is the need for protecting it.

The book is divided into three parts: Mammals, Birds, and Fishes; and the usual biological headings are used, but the terms are translated for boys and girls so that words like "Family" are given a new and special meaning.

The book is an excellent development of the philosophy expressed: "Men and women, girls and boys, live in this same world and share its air, soil, water, trees, grass and other good things with these animals. They are part of our life and we are part of theirs. Unless we know these wild animals rather well, we will miss much enjoyment."

The treatment of the different species is brightened by narrative accounts as in the case of the beaver, where a story of two boys visiting a beaver dam is told at length.

There is a chapter on early days in Idaho; a whole story in itself, and another on game laws, that is well worth reading.

The Cougar-hunt seems to depart in some measure from the philosophical aim mentioned above, although it is undoubtedly a factual account. Nowhere do I find in it a word on the usefulness of the Cougar and the urgent need for its protection.

The introduction of the Bird Part asks the question, "How many kinds of birds are there around your home?" and "Do you know the names of all of them?" The Fish Part has a story on fishing that will delight youthful readers; as well as a great deal of Ichthyology.

On the whole, a new book that breaks new ground and is good value for the low price. Ten thousand copies have been given to the children of the sixth, seventh, and eighth grades by the Fish and Game Commission.—HOYES LLOYD.

AMERICAN BUTTERFLIES AND MOTHS; by Cecile Hulse Matschat; illustrated by Rudolf Freund; Random House, 70 pp.; published by The Macmillan Co., Toronto, price \$5.50.

This book presents an interesting combination of science and art. In its method of exposition and format it is designed to satisfy the aesthetic sense, yet its subject-matter is the closest possible approach to the authentic. Thus it is eminently fitted to appeal to intelligent people of all ages who enjoy leisure in the country (alas! a much depleted group in these days).

Mrs. Matschat, who has collected extensively in Latin America, has chosen for discussion 73 of the larger, more abundant or especially interesting species of butterflies and moths. This involves a description of the adult, of the caterpillar, and of its life-cycle and food-plants. The whole is embellished by numerous coloured drawings by Rudolf Freund, which are composed with notable artistry, but unfortunately scattered rather haphazardly throughout the book. The reader will be struck by a few errors in technical nomenclature, such as *Celeris*, *disippus*, and *promonella*; and, although there is an index, a considerable proportion of the pages are not numbered. However, taken for all in all, this book of quarto size well merits recommendation as a luxury gift to a young naturalist.—A. W. A. BROWN.

STRANGE NEW WORLD; by Alec H. Chisholm; Angus and Robertson, Sydney, Australia, 1941; 382 pp., illustrated; price about \$3.50.

Recent events have heightened our interest in our sister Dominion, Australia. Thus it is all the more reason that this book should merit the attention of Canadian naturalists. It deals with the epic overland journey in 1844-5 of Ludwig Leichhardt, explorer and John Gilbert, naturalist from Brisbane to

Port Darwin, a distance of 3,000 miles through unexplored and often hostile country. The author was fortunate enough to discover in England the original diary of Gilbert, and this forms the nucleus of his book. Not only did it reveal valuable information on the fauna of Queensland before the advent of the white man, but also gave an eye-witness account of the expedition (of which one member was a paroled convict and two were aborigines) alone in the limitless bush of the sub-continent, under the erratic leadership of the neurotic Leichhardt. The author is at pains to bring out Gilbert's immense contribution to the enterprise—in which he met his death—and to "debunk" the somewhat spurious fame that Leichhardt earned therefrom.

Mr. Chisholm, a naturalist of repute "down under", has made this book particularly interesting to Canadian ornithologists. They may see through the explorers' eyes the first wonders of bell-bird and bower-bird, jungle-fowl and mallee-fowl, and numerous new species of parrots, ducks, finches, warblers, wrens, honey-eaters and wood-swallows. The botanist will get the "feel" of the dry uplands of interior Queensland, so much fuller of life than our own southern Alberta. And the casual reader will be enthralled by the unfolding of this true story of exploration a century ago. It is to be hoped that this book will find the circulation it deserves in Canada.—A. W. A. BROWN.

THE DUCKS, GEESE AND SWANS OF NORTH AMERICA, *A vade mecum for the Naturalist and the Sportsman*, by Francis H. Kortright, Illustrations by T. M. Shortt, Published by The American Wildlife Institute, Washington, D.C., 1942. Price \$4.50 in U.S., \$5.50 in Canada.

Believing that most gunners want to know more about the waterfowl that they pursue, but that the information that they would like to have has hitherto been so scattered in specialized scientific works that it was not readily available, the author of this attractive and convenient volume, himself a Canadian sportsman and manufacturer, not an ornithologist, set about the heavy task of filling the unoccupied gap with which he had become impressed. In so doing he displayed rare ability to recognize his own lack in technical knowledge and experience in ornithology and to accept sound advice. He made good use of the best available scientific literature; obtained the co-operation of leading museums, particularly that of the Royal Ontario Museum of Zoology; caused his descriptions of plumages to be taken direct from large series of specimens by a competent ornithologist; arranged to have his work abundantly illustrated in colour by that gifted ornithological artist, Mr. T. M. Shortt, of Toronto; secured special contributions from such leaders as Professor Aldo Leopold, Dr. Ira N. Gabrielson, Frederick C. Lincoln, and H. Albert Hochbaum; and personally worked and wrote with such industry and ardor that he was forced temporarily into a sick-bed.

The outcome is a handsome octavo volume of nearly 500 pages, authoritative, but pre-

pared from the sportsman's point of view and delightfully easy to read, extensive in treatment but convenient in size and form, accurate in the details of its text but accompanying that text with abundant illustrations and maps that adorn while they supply concentrated information, furnished with the best material of previous publications and marking advances by much that is new. The "Contents" of the volume include an Introduction by Professor Leopold, a diagrammatic "Family tree" of the ducks, geese and swans, a handy glossary, a popular and illuminating essay on scientific nomenclature that both sportsmen and scientists will enjoy, an account of moults and plumages, directions for identification of a specimen in hand and for determination of sex and age, general statements on mating, nesting and feeding habits, sections devoted to longevity, speed of flight, hybridism, botulism, and lead poisoning, treatment of waterfowl migration and waterfowl banding by Frederick C. Lincoln, a summary of waterfowl conservation by Dr. Ira N. Gabrielson, Director of the United States Fish and Wildlife Service, records of weights and measurements of wildfowl, a very useful bibliography, an extensive series of colour plates, and detailed, interesting and informative descriptions, identifications and life stories of the ducks, geese and swans.

Examination of a typical part devoted to a single species, the American Pintail, shows the following items, conveniently arranged. The standard English name, "American Pintail", is followed by the scientific name as given in the 1931 edition of the A.O.U. 'Check-List' and as given in J. L. Peters's "Check-List of Birds of the World", with directions for pronunciation and an explanation of the origin of the scientific terms, after which 34 colloquial names are recorded. There are detailed descriptions of the winter plumage, eclipse plumage, and autumn plumage of the adult male, of the plumage of the adult female, and of the plumages and plumage changes of the juveniles. A section on "Specimen Identification" contains a paragraph relating to the male and another relating to the female, while a section devoted to "Field Marks" is divided into three paragraphs, headed respectively "On the Water", "In Flight", and "Voice". In conclusion there are nearly four pages of the "Life Story" of this duck. The text devoted to the Pintail is illustrated by a map of North America, showing the main breeding and wintering ranges of this species, and by six separate black-and-white drawings by Mr. Shortt that, with a life-likeness and a sense of action that have to be seen to be realized, depict Pintails in flight, swimming idly, and dabbling for food.

One of the parts of the book that, in the reviewer's opinion, will be most used is the splendid series of colour plates of waterfowl, specializing in showing the fall plumages, with which sportsmen most often have to deal, and the diagnostic pattern and colouring of the spread wing. The Pintail is represented here by a portrait of an adult male in full plum-

age, a view of the spread wing of an adult male, a portrait of an adult female, a view of the spread wing of an adult female, two portraits showing the adult male as he appears in different stages of the autumn molt, a portrait of a downy duckling and two portraits showing hybrids between Pintail and Mallard. Mr. Shortt has long been known as a developing ornithologist and artist of marked ability and talent, but in illustrating this waterfowl book in colour and in black-and-white he has had an opportunity to display his exceptional gifts in profusion and has accomplished a work of outstanding excellence that marks him as being in the front rank of bird artists.

"The Ducks, Geese and Swans of North America" is a great credit to its author, illustrator, and publishers and a great boon to all who are interested, from any point of view, in the waterfowl of this continent. It not only fills most usefully the gap for which it was planned, but ornaments the literature of its subject. Every effort has been made to keep its price as low as possible, and indeed it is remarkable that such exceptional value can be provided so inexpensively. Sooner or later it is sure to find its way into every library, public or private, that is at all concerned with its subject matter.—HARRISON F. LEWIS.

COLLEGE ENTOMOLOGY; by E. O. Essig; *The Macmillan Company, New York, 1942; pp. vii+900, 308 figs.; price \$5.00.*

Professor Essig in his *College Entomology* presents what many amateur collectors have been seeking, namely a key to the Orders and Families of insects. In addition, the book is full of valuable information on the life history, habits, anatomy, and selected literature of the various Orders considered.

The 308 figures, which have been well chosen and the parts clearly labelled, not only give the reader a picture of the external anatomy of the insect in question but also assist in the use of the key to the Families.

Professor Essig has tried to present the latest classification of insects. For example, the Orthoptera had been considered as an Order comprising the grasshoppers, crickets, cockroaches, mantids, phasmids and, in some works, the earwigs; but in *College Entomology* each of these groups of insects has been given ordinal rank, namely Orthoptera (grasshoppers and crickets), Blattaria (cockroaches), Mantodea (mantids), Phasmida (phasmids), and Dermaptera (earwigs).

College Entomology is certainly a reference book which every naturalist should possess.—F. A. URQUHART.

CHANGE OF ADDRESS

A faithful supporter, C. W. G. Eifrig, who has been a subscriber to *The Canadian Field-Naturalist* since 1895, recently living at 1029 Monroe Avenue, River Forest, Illinois, should now be addressed: Windermere, Orange Co., Florida.

SIXTY-FOURTH ANNUAL MEETING OF THE
OTTAWA FIELD-NATURALISTS' CLUB
REPORT OF COUNCIL

MEETINGS.—During 1942 there were five council meetings, with an average attendance of thirteen members. The meetings were held in the office of the Agricultural Representative, 295 Albert St., Ottawa, on January 29, March 17, May 27, October 5, and November 24.

EXCURSIONS COMMITTEE.—Ten field excursions were held during the year, six in the spring, one in the summer, and three in the fall. These included two all day Sunday excursions which proved very successful. The excursions were as follows:

May 2—McKay Lake
May 9—Billings' Bridge
May 16—Britannia
May 30—Val Tetreau
June 6—Rideau River
June 20—Merivale Road
July 12—Queen's Park, Aylmer
September 26—Fairy Lake
October 3—Britannia
October 18—Kirk's Ferry

Five lectures were given at St. Patrick's College as follows:

January 8—Interesting young people in natural history, by Dr. H. Bowers.
February 12—Round table discussion.
March 12—Dyes from field and forest, by Dr. D. Leechman.
April 9—Report on the flora of Gatineau Park, by Dr. H. A. Senn.
November 19—A naturalist in New Guinea, by Dr. A. L. Rand.

During the month of April study groups were organized with a view to giving beginners a little preliminary instruction before going on the field excursions. Three groups were organized, one in ornithology which met at St. Patrick's College, one in botany, and one in mycology, both of which met at the Division of Botany and Plant Pathology, Central Experimental Farm. Each group held three meetings and they were well attended. Similar groups were again organized in November, in ornithology, flowering plants and ferns, and mosses, with the intention of meeting at intervals during the winter.

Total financial receipts for the year were \$46.45 and special mention is made of a donation of \$10.00 by students of the Ottawa Normal School. Expenses were \$30.03, leaving a balance of \$16.42.

PUBLICATIONS COMMITTEE.—The committee encountered difficulties in the printing of the *Canadian Field-Naturalist* this year and the numbers were very late in appearing. This was due chiefly to the fact that the printers were extremely busy with urgent government orders and other things had to wait. The editor, Dr. A. W. A. Brown, left in November to join the armed forces and Dr. H. A. Senn

agreed to carry on for the remainder of the year. The sudden death in November of Mr. H. C. Miller, who had printed the *Canadian Field-Naturalist* for over twenty years, was greatly regretted.

A new contract has now been arranged with The Jackson Press, Kingston, Ontario, and it is hoped to have the issues appearing on time very soon. The size of the magazine is also to be increased.

MEMBERSHIP COMMITTEE.—A letter was sent out over the President's signature to a list of one hundred and seventy-seven names of biologists and others who it was thought might be interested. As a result thirty-seven new memberships have been obtained, including some who had been members formerly but had allowed their memberships to lapse.

BIRD CENSUS COMMITTEE.—The report of the Bird Census Committee was published in the February number of the *Canadian Field-Naturalist*. The Ottawa Christmas census was taken on December 21, 1941, by twenty observers in nine parties. A total of 28 species and 2,042 individuals was reported. Two species, the Black Duck and American Three-toed Woodpecker, were reported for the first time in the Ottawa Christmas bird census.

MACOUN GROUP.—The Macoun Group held four meetings in 1942 as follows:

February 3—Mr. A. E. Persild spoke on Greenland and showed a film in colour which he had taken the previous summer.
March 3—Dr. C. H. D. Clarke discussed the Glacial History of North America in relation to the distribution of plants and animals.
April 7—Dr. A. L. Rand discussed some aspects of museum activities.
May 5—Mr. Hoyes Lloyd spoke on Wild Life Conservation in Canada.

ACKNOWLEDGMENTS.—The Council of 1942 wishes to take this opportunity to express its appreciation to the authorities of St. Patrick's College for placing rooms and equipment at the disposal of the Club for lectures and study groups; to the Division of Botany and Plant Pathology, Central Experimental Farm, for making its facilities available to the study groups; and to Mr. W. M. Croskery, Agricultural Representative, for the use of his office for meetings of Council and of the Macoun Group. The hospitality of Mr. and Mrs. H. G. Crawford in opening their summer home at Kirk's Ferry to the Club for the final field excursion is deeply appreciated. The Council is grateful to those members who have assisted with the Excursions and other club activities during the past year and would urge the continued enthusiastic support of the incoming Council for 1943.

J. WALTON GROVES,
Secretary.

STATEMENT OF FINANCIAL STANDING
OTTAWA FIELD-NATURALISTS' CLUB, DECEMBER 7, 1942

CURRENT ACCOUNT

| ASSETS | | LIABILITIES | |
|-----------------------------------|-------------------|-----------------------------------|-------------------|
| Balance in Bank, December 7, 1942 | \$ 377.55 | Reserve Fund | \$ 15.02 |
| Bills Receivable | 6.00 | Balance | 368.53 |
| | <u>\$ 383.55</u> | | <u>\$ 383.55</u> |
| RECEIPTS | | EXPENDITURES | |
| Balance in Bank, December 8, 1941 | 13.29 | <i>Canadian Field-Naturalist</i> | 546.00 |
| Fees— | | Editor | 50.00 |
| Current | 664.31 | Separates and Illustrations | 147.75 |
| Advances and Arrears | 92.15 | Postage and Stationery | 61.90 |
| Separates and Illustrations | 251.94 | Miscellaneous | 45.28 |
| Single and Back Numbers | 186.91 | Bank Discount | 20.40 |
| Miscellaneous | 40.28 | Balance in Bank, December 7, 1942 | 377.55 |
| | <u>\$ 1248.88</u> | | <u>\$ 1248.88</u> |

RESERVE FUND

| ASSETS | | LIABILITIES | |
|-----------------------------------|-------------------|--------------|--|
| Canadian Government Bonds | \$ 1300.00 | Nil. | |
| Bills Receivable | 43.52 | | |
| Balance in Bank, December 7, 1942 | 232.55 | | |
| | <u>\$ 1576.07</u> | | |
| RECEIPTS | | EXPENDITURES | |
| Balance in Bank, December 8, 1941 | 200.99 | Nil. | |
| Bond Interest | 28.50 | | |
| Bank Interest | 3.06 | | |
| | <u>\$ 232.55</u> | | |
| Balance in Bank, December 7, 1942 | \$ 232.55 | | |

PUBLICATION FUND

| ASSETS | | LIABILITIES | |
|-----------------------------------|-------------------|--------------|--|
| Canadian Government Bonds | \$ 1000.00 | Nil. | |
| Bills receivable | 21.25 | | |
| Balance in Bank, December 7, 1942 | 94.89 | | |
| | <u>\$ 1116.14</u> | | |
| RECEIPTS | | EXPENDITURES | |
| Balance in Bank, December 8, 1941 | 72.40 | Nil. | |
| Bond Interest | 21.25 | | |
| Bank Interest | 1.24 | | |
| | <u>\$ 94.89</u> | | |
| Balance in Bank, December 7, 1942 | \$ 94.89 | | |

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Dec. 8, 1942.

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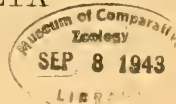
Nos. 2 & 3

BIRDS OF THE MACKENZIE DELTA¹

By A. E. PORSILD

National Museum of Canada

25,343



DURING THE PERIODS April, 1927 to February, 1928 and October, 1931 to October, 1935, I was almost continuously in the Mackenzie Delta carrying on investigations for the Department of the Interior. In 1927 I was in the Eskimo Lake section of the Delta, in the second period in the Delta proper. Observations on birds were made, and specimens collected as opportunity offered, in the course of my other work, which kept me in the field most of the time.

The present report contains a summary of my own observations, fortunately over a long enough period to give an idea of the status of the bird life, and its fluctuations. My own observations have been supplemented by valuable information on local distribution and abundance by numerous Eskimo residents of the Mackenzie Delta. Numerous observations, backed by more than 100 skins, were supplied by Mr. K. H. Lang, an exceptionally keen and accurate observer who for many years has been a resident trapper and trader in the Mackenzie Delta. There has been little published on the birds of this region since Preble's paper on the whole Mackenzie area (1908, *North Amer. Fauna* No. 27). The most important publications are,—MacFarlane, 1908, pp. 287-447 in *Through the Mackenzie Basin*, by Charles Mair, Toronto. 1908 and Anderson, 1913, pp. 456-494 in *My Life with the Eskimo*, by Vilhjalmur Stefansson, New York, 1913.

The specimens collected are deposited in the National Museum of Canada, and I have used the files of the bird division in working up this report. I am indebted to Dr. R. M. Anderson for encouraging the study and compilation of notes on the bird life in the Delta and for references to literature: to Mr. P. A. Taverner for checking and verifying field determinations as to species and to Dr. A. L. Rand, all of the National Museum of Canada,

for arranging and editing my notes for publication. Notes were also received from Dr. C. H. D. Clarke, of the Northwest Territories Administration, who visited the Delta in 1942.

The Mackenzie Delta is especially interesting as being at almost the northwest corner of Canada, where tree limit reaches its farthest north. The forest following down the Mackenzie, carries forest bird species farther north than elsewhere in Canada. The northern part of the Delta, being north of the timber line, carries an arctic avifauna.

A description of the area has already been given in "*The Mackenzie Delta as a breeding ground for Waterfowl*" by A. E. Porsild², a paper read before the American Game Conference at New York, Jan. 1935, but it is advisable to summarize it here.

The Mackenzie Delta as here treated, including the Delta proper and the basin of the Eskimo Lakes, is roughly triangular. From its southern end (Point Separation), latitude 67° 35' to the coast is about 100 miles; along the Arctic Coast it extends for about 200 miles from the mouth of the West (or Peel) Branch to the mouth of the Anderson River. This comprises about 10,000 square miles.

The Delta proper has three main branches, the Western or Peel Channel, the Middle Channel, and the Eastern Channel. For the rest there is a broad, fan-shaped area of channels, lakes, swamps and low islands. To the west the Richardson Mountains rise to 5000 feet; east of the East Branch the Caribou Hills, rising to 500 feet, separate the Delta proper from the low, flat Eskimo Lake country.

The southern part of the Delta, to within 40 miles of the Arctic Ocean is well wooded with White Spruce, Black Spruce and Balsam Poplar. The White Spruce here reaches 18"

2. —See also: A. E. Porsild, Reindeer Grazing in Northwest Canada, Department Interior, Ottawa, 1929. Earth Mounds in Unglaciated Arctic Northwestern Canada — "Geogr. Review" 28 : 46-58 (1938).

1. —Received for publication Jan. 30, 1943.

in diameter, and is the most important tree. From airplane reconnaissances it was seen that this forest is limited to the banks of the channel that are somewhat raised above average water level, and that back from these banks the land becomes low, marshy and covered with almost impenetrable willow thickets.

North of the tree limit the aspect of the Delta changes. The banks become somewhat lower and spruce and poplar are replaced by willow and alder. Near the tree limit the willows may reach 15 feet in height but northward they become lower. Most of the islands are covered with almost impenetrable jungles of willow, and the meadows become more extensive.

The Caribou Hills form a nearly one hundred mile long ridge which separates the Delta from the Eskimo Lake basin. The hills rise abruptly from the East Branch of the Mackenzie Delta to a gently rolling plateau slightly over 500 ft. above the river. At Tununuk, in latitude 69°, the river has cut through the Caribou Hills, forming Richards Island which is roughly fifty miles long and forty miles wide. Richards Island, with a number of smaller islands to the westward, belongs to the same formation as the Caribou Hills and is inhabited by the same species of birds. A short distance east of the Delta the Caribou Hills slope gently toward the east and northeast.

The higher parts of the plateau are covered with dry, upland tundra, chiefly composed of sedges, ground birch and low willows. The precipitation is very light and all streams are small and dry out during the summer. This type of country is the home of the Hudsonian Curlew, the Willow Ptarmigan and the Golden Plover.

As we proceed towards the east and north the country gets lower; small and large lakes and swamps cover the plain, almost to the exclusion of dry land. Most of the smaller lakes are without proper outlet, and the water seeps from one lake into the next through marshes that were once part of the lake. This is par excellence the summer home of the small waders of which about fifteen species are found breeding.

The principal breeding grounds of geese in the Mackenzie Delta are found on the large lakes known as the Eskimo Lakes, and in the northern part of Richards Island. These places due to their remoteness from the common routes of travel and to ice conditions during the height of the breeding season are rarely visited by man.

Open water appears along the river banks in May and the river becomes clear of ice by the first of June. When the ice disappears practically all the Delta, excepting only the highest river banks, is flooded. But the water begins to drop in a few days. In the Eskimo basin most of the snow is gone by the end of May. On the high tundra the ground is dry and flowers appear by the end of May. Muskegs and swamps stay wet and cold until the end of June. Small tundra ponds are open at the end of May; large lakes have drift ice until the second week of July.

Sharp frosts occur the last half of August, when all plant growth is over; snow comes in September, and the freeze-up of the main channels occurs about the second week of October.

1. *Gavia immer immer* (Brunnich) COMMON LOON.

Eskimo: TUHLIK TARSINEQ (the TUHLIK with the black bill).

A summer resident of somewhat infrequent occurrence, found breeding on the Peel Branch only.

The Common Loon is well known to the older Mackenzie Eskimo, and is used sometimes as a head ornament, worn by men at the Eskimo dances.

2. *Gavia adamsi* (GRAY) YELLOW-BILLED LOON.

Eskimo: TUHLIK.

A fairly common summer resident in the large lakes on the Barrens east of the Mackenzie Delta, where according to the Delta Eskimo it nests in large, shallow lakes. The nest is said to be made on small hummocks, or on small islands in such lakes, the nest containing two eggs.

The Yellow-billed Loon, one of the best known birds in the old Eskimo legends, is credited with super-natural powers, and, according to one legend attacks a kayak approaching its nest, and punctures the kayak from beneath. The head, neck and sides of the Yellow-billed Loon are much prized as a head ornament, worn by the men at the Eskimo dances.

This species was seldom seen in the Delta, and then mostly in flight. Lang observed one pair on a lake on the lower Peel Channel on June 6, 1934, and 3 birds were observed on the East Branch, June 1, 1935; according to the Eskimos it does not nest in the Delta.

3 *Gavia artica pacifica* (Lawrence) PACIFIC LOON.

Eskimo: MALARE (meaning not known).

This is the most common of the loons in the Delta, where it nests wherever found. The Pacific Loon, unlike the other species prefers rivers to lakes.

In 1932 the Pacific Loon was first observed at Kittigazuit on June 2; on the East Branch the following year the first specimens were seen June 9th; while on the Peel Branch it was observed by Lang on May 25th.

Three adult specimens were taken, June 10 and July 20.

4. *Gavia stellata* (Pontoppidan) RED-THROATED LOON.

Eskimo: GAHAURAU or GAHURALUKPIK (Kittigazuit) (the one that says GA-GA-GA-GA).

Common summer resident in the Delta, but breeding sparingly in the low, alluvial part. Its principal breeding grounds are in the tundra, north of the tree-limit, where it is found breeding in nearly all the small lakes.

On July 21, 1927, one pair with newly hatched young were seen in a small pond on the north end of Richards Island.

In 1932, the species was first observed at Kittigazuit during the last week of May.

Two specimens were taken in July.

5. *Colymbus grisegena holboelli* (Reinhardt) HOLBOELL'S GREBE.

Eskimo: SOROLEQ (meaning not known)

A common summer resident in the wooded part of the Delta where it nests wherever found; somewhat rare north of the tree limit.

The species frequents lakes and ponds, where it nests in the grassy fringes, and is but rarely seen on the rivers and Delta channels. However on September 21, 1934, when due to a sudden drop in the temperature all the lakes in the Delta froze over, Holboell's Grebes, were observed in flocks of from two to ten individuals on the rivers and channels between the East Branch and Aklavik. In all, probably 50 birds were seen.

In 1935 first observed on the Peel River June 1 (Lang) and on the East Branch June 11-13; Clarke saw downy young at Aklavik on July 18, 1942.

Five specimens were taken from June 1 to Sept. 21.

6. *Colymbus auritus* Linnaeus HORNED GREBE

Eskimo: SOROLATSIK (a small SOROLEQ).

Like the Holboell's Grebe a common summer resident in the wooded part of the Delta, probably breeding wherever found; somewhat rarer north of the tree-limit. On June 2, 1934, one pair was seen in a lake on the southern end of Richards Island. The male was taken.

7. *Cygnus columbianus* (Ord) WHISTLING SWAN.

Eskimo: KRUGLUK.

Common summer resident in the Mackenzie Delta and in the large lakes in the Eskimo Lake basin. It breeds north of the tree-limit.

In the Delta the Swans are more abundant on the Middle Branch and the East Branch than in the Western part of the Delta. One pair remained (and probably bred) in the lake near Black Mt., (Lang, 1930).

The species was first observed at Kittigazuit on May 9, 1932, which is the earliest date I have observed the bird.

In 1933 the first birds were seen on the East Branch on May 15.

One pair in moult, with downy young were seen on the Eskimo Lakes, Aug. 22, 1927. On June 21, the same year a nest containing six eggs in an advanced state of incubation was found on the portage between Campbell and Setidgi Lakes. The nest was situated in a dry muskeg bog, on a mound four feet in diameter and two feet high, chiefly composed of large chunks of the sphagnum. The nest was sparsely lined with grass and down.

On October 3, 1934, one young still unable to fly was seen on the lower East Branch. In 1933 the last Swans were seen over the East Branch on October 12, when the river was still open.

On June 10, 1935, a nest of 5 eggs was reported near Kittigazuit; one egg was broken and found to be in an advanced state of incubation.

Since the writer first visited the Mackenzie Delta, in 1927, the Whistling Swans appear to have increased considerably in numbers.

The down of the swan is highly prized by the Eskimo for the making of sleeping bags and down filled winter garments. Young birds are also prized for food.

An immature bird with a wing length of 430 mm. was taken September 2, 1934.

8. *Branta canadensis leucopareia* (Brandt)

LESSER CANADA GOOSE.

Eskimo: ULUALIK, NEGLEK (goose with the cheeks) or ULUALIK.

A common summer resident, which formerly bred more extensively in the Delta, but which is now restricted to the more inaccessible parts. At the present time its principal breeding grounds are found on the north end of Richards Island, and on the large lakes in the Eskimo Lakes basin east of the Delta. These places are practically inaccessible during the height of the nesting season.

In 1932 the first Canada Geese were seen at Kittigazuit on May 16, but May 20-25 is perhaps the usual date for the arrival of this species. The fall migration passes over the Delta September 10-15. In migration practically all birds pass over the western part of the Delta and but few flocks are seen on the East Branch.

9. *Branta nigricans* (Lawrence) BLACK BRANT

Eskimo: NEGLEKENAK (the real NEGLEK).

Common summer resident, breeding abundantly on the islands north of the Mackenzie Delta, and on the Arctic sea-coast east of the Delta; according to the Eskimo now not as abundant as formerly; also common in the large lakes of the Eskimo Lake basin, and in the deltas of the Anderson and Kugaruk Rivers.

In both spring and fall migration the Brant appears to follow the coast of the Arctic Ocean from west to east and back.

10. *Anser albifrons* subspecies WHITE-

FRONTED GOOSE.

Eskimo: TIGMIAK or KIGIUK.

A summer resident, breeding on the north end of Richards Island and in the Eskimo Lake basin, where it is less abundant than the Snow Goose and the Lesser Canada Goose.

One pair was seen at Kittigazuit on May 31 1932; in 1935 it was first observed at the East Branch, Reindeer Station on May 14.

No specimens were secured. The breeding ranges of the two American forms *albifrons* and *gambeli* is yet to be worked out, as that of *gambeli* is still unknown.

11. *Chen hyperborea hyperborea* (Pallas)

LESSER SNOW GOOSE.

Eskimo: KANGUK.

Common summer resident; breeds on the

north end of Richards Island, and in the Eskimo Lake basin.

In 1927 the first Snow-Geese in migration passed Aklavik on May 9. In 1932 the species was first observed at Kittigazuit on May 10. Two males were taken on May 18, 1932. The crops of these birds contained nothing but *Equisetum variegatum*. On May 22, 1932, the last flock of Snow-Geese passed Kittigazuit.

During the spring migration Snow Geese are seen passing over the western part of the Delta, and were rarely seen over the East Branch, though on May 31, 1935, 2 flocks passed over the East Branch. Numerous flocks in migration were seen on September 10, 1933, in westward migration, following the edge of the Delta.

The two specimens collected (males) measure: wing 397 and 425 mm.; bill 58 and 60 mm.; the smaller is evidently a yearling, with brownish wing tips and some brownish feathers on the back and neck.

12. *Chen caerulescens* (Linnaeus) BLUE GOOSE.

Clarke observed a single adult Blue Goose in a large flock of Snow Geese flying over Tuktoyaktuk on September 9, 1942. The species was unknown to natives present at the time this observation was made.

13. *Anas platyrhynchos platyrhynchos* Linnaeus MALLARD.

Eskimo: QERHALUGTOK (the one that says Qer-Qer).

A fairly common summer resident and breeding in the Delta to well north of the tree-limit.

The species generally arrives in the Delta during the latter part of May. In 1934, Lang observed the Mallard on the Peel Channel on May 16, and in 1930 saw a female with seven downy young on June 15.

One pair were taken near Kittigazuit Sept. 29, 1931. On October 12, 1933, six Mallards were observed on the East Branch. This is one of the last ducks to leave the Delta in the autumn. It is often seen in company with Pintails. On June 28, 1935, a male was taken on the East Branch, Reindeer Station.

14. *Mareca americana* (Gmelin) BALDPATE.

Perhaps the most common duck in the Mackenzie Delta, breeding chiefly south of the tree-limit. Has not been observed in the Eskimo Lake Basin.

In 1932, the Baldpate was first observed at

Kittigazuit on May 25, when a male was taken. The species is rather gregarious and during the nesting season males and non-breeding females are seen daily in large flocks, often associated with Surf Scoters, Scaups and Goldeneyes.

Lang reports having found a number of nests on the Peel Channel.

In 1935 it was apparently less common than in 1934; earliest seen May 24 on the East Branch.

Four males were taken May 24 to Oct 20.

15. *Dafla acuta tzitzihoa* (Vieillot) AMERICAN PINTAIL.

Kittigazuit Eskimo: IVURAK: Nuna-tamio Eskimo: KULUVAK.

Common summer resident, breeding throughout the Delta and the Eskimo Lake basin.

This is one of the earliest ducks to arrive in the Delta. In 1932 the Pintail was first observed at Kittigazuit on May 10; in 1934, Lang first saw it on the Peel Branch on May 17.

Its principal breeding ground perhaps is on the large lagoons and lakes along the Arctic coast, east of the Delta. At Cape Dalhousie large flocks of moulting birds were seen and several were taken the first week of August, 1927.

A pair with six or eight young of the size of a Canada Jay was seen on the border of a lake near the East Branch, Aug. 4, 1934, when the male was taken.

The Eskimo report that the Pintail often hybridizes with the Baldpate and Mallard.

In 1935 it was more common than in any previous season. Flocks of 100 or more frequently were seen on the rivers, often with a few mallards. On Aug. 4 a female with a brood of young the size of Canada Jays was seen.

By local residents the name "pintail" is as often applied to old-squaw as to this species.

Five specimens were collected between June 10 and Sept. 25.

16. *Nettion carolinense* (Gmelin) GREEN-WINGED TEAL.

A somewhat rare summer resident, except in the wooded part of the Delta, where it is common. Clarke saw broods of young at Aklavik and Tuktoyaktuk in 1942.

In 1932, the Green-winged Teal was observed at Kittigazuit on May 25, when a male was taken. In 1934, Lang first observed the species on the Peel Channel on May 18.

It is seen occasionally during the summer in the Delta, but seldom frequents the larger rivers and therefore often escapes notice.

Three specimens were taken May 24 and June 6.

17. *Spatula clypeata* (Linnaeus) SHOVELLER.

Eskimo: KULUARPAK (large bill).

A fairly rare summer resident, reported by the Eskimo as breeding wherever found.

Two birds, taken by Eskimos near Tent Island, September 1933 and four taken by Eskimos near the Reindeer Station on the Mackenzie East Branch, September 1934 were examined. In 1934, Lang reported seeing two males and four females on a lake near Black Mountain, on June 16. Lang also reports having observed the species occasionally each year since 1929. In 1935 it was first observed on the East Branch on June 10.

18. *Nyroca valisineria* (Wilson) CANVAS-BACK.

One was seen at Aklavik by C.H.D. Clarke on July 20, 1942.

19. *Nyroca marila* (Linnaeus) GREATER SCAUP DUCK.

A somewhat infrequent summer resident, and no doubt breeding wherever found. Clarke identified this species, accompanied by young, at Aklavik July 18-21, 1942.

On May 25 in 1932, two males and one female were taken near Kittigazuit, where several more of this species were seen feeding on mollusks in a small pond, in company with Surf Scoters and Baldpates. In 1934 several birds were seen occasionally during the summer. Several were seen on the East Branch on June 18, when two males were collected. Lang reports seeing the species on the Peel Channel on May 13, 1934. In 1935 from June 11 to 13 it was very common on the East Branch. A number were seen by Clarke on the open sea in August 1942.

Four specimens were secured, taken between May 25 and June 18.

20. *Nyroca affinis* (Eyton) LESSER SCAUP DUCK.

Eskimo: NUNAGELAK.

A fairly common summer resident, probably breeding wherever found.

In 1932, one small flock was observed, on June 10, near Tununuk. In 1934 one female was taken on the lower East Branch on September 28. Lang reports having seen the species on May 28, 1934, on the Peel. In 1935,

one pair was taken on the East Branch on June 6.

Three specimens were secured, taken June 6 and Sept. 28.

21. *Glaucionetta clangula americana* (Bonaparte) AMERICAN GOLDEN-EYE.

Eskimo: NIAQORULUK (with the funny head).

Fairly common summer resident, probably breeding wherever found; rarely observed north of the tree-limit.

In 1933 one flock of six females and one male was seen on the East Branch, near the Reindeer Station on June 23, when two females were collected. On June 28, 1934, in a large mixed flock of ducks, floating down the East Branch, I observed 7 male Golden-eyes. It was seen frequently during the summer. On September 21, 1934, four were collected on the Schooner Channel. One nest containing one infertile egg was found in hollow tree near the East Branch during the winter of 1933-34. Lang first observed the species on the Peel Branch on May 20, 1934. In 1935 it was more common than in any previous season; first observed on June 11 when several were seen. A female taken on June 24 had ova the size of peas.

Seven specimens were prepared; taken from June 24 to Sept. 21.

22. *Clangula hyemalis* (Linnaeus) OLD SQUAW.

Eskimo: AHARALIK (from the voice).

One of the most common ducks in the Delta during the early spring, though breeding but rarely in the Delta. Its principal breeding grounds are in the small tundra lakes on the Barrens east and north of the Delta. During the breeding season small flocks are often observed swooping down to the river from the hills east of the East Branch. The flight is so rapid that the birds can barely be followed by the eye. In the downward swoop the birds produce a buzz, not unlike that of a large calibre shell passing overhead.

In 1932, the first Old Squaws were seen at Kittigazuit, on May 8. During the first week of June they were seen daily in large, goose-like, wedge-shaped phalanges in eastward migration. A nest containing 9 almost hatched eggs was found near Setidgi Lake on June 22, 1927.

In 1935 it was first observed on the East Branch on May 22 when 16 birds were seen. One male was still in full winter plumage

while 7 others were in summer dress.

A single male in winter plumage taken on May 28, was saved.

23. *Somateria v-nigra* GRAY PACIFIC EIDER.
Eskimo: MITEQ.

A summer resident of the islands off the Mackenzie Delta and of the coast to the eastward.

Large moulting flocks were seen at Cape Dalhousie and in Liverpool Bay, August, 1927. One female, probably of this species, was seen on the ice, off Kendall Island, on December 15, 1927, when no open water was visible.

One specimen taken in July was preserved.

24. *Somateria spectabilis* (Linnaeus) KING EIDER.

Eskimo: QIGALIK (with the nose).

A summer resident on Kendall and Garry Islands north of the Mackenzie Delta and of the coast to the eastward; undoubtedly nesting in suitable places.

Eiders have never been observed on the rivers of the Delta.

Small flocks of from 10-20, probably of this species were seen near Shingle Point, July, 1934.

25. *Melanitta deglandi* (Bonaparte) WHITE-WINGED SCOTER.

Eskimo: TONERAVIK.

A common summer resident in the wooded part of the Delta, occurring perhaps less commonly north of the tree limit. Probably breeding wherever found.

On May 25, 1932, one pair was taken at Kittigazuit. On August 5, 1932, a parent bird with a brood of downy young the size of Canada Jays were seen near the Reindeer Station. Lang observed the species on the Peel May 25, 1934, and states that the bird is not very common on the Peel or Husky Channel. On June 22, 1934, a flock of males was observed on the river. In 1935 it was first observed on the East Branch on May 31, when 4 were seen. It was less abundant in 1935 than in 1934.

Two specimens were taken on June 1, 1932 and preserved.

26. *Melanitta perspicillata* (Linnaeus) SURF SCOTER.

Eskimo: AVILORTOQ (he says AVI).

A common summer resident, probably breeding wherever found; decidedly more scarce north of tree-limit than the White-winged Scoter.

On June 3, 1932, one pair was taken on lower East Branch; June 23-25, 1934, large flocks of males and non-breeding females were observed daily on the rivers. Lang first observed the species May 20, 1934, on the Peel, where he states that it is very common. In 1935 it was first observed on the East Branch on June 10 when ten birds were seen; this year it was more abundant than in any preceding season; June 26-29 large flocks of males and non-breeding females were seen on the rivers. In early August, 1942, Clarke saw large numbers on the open sea.

Five specimens preserved were taken from June 8 to 16.

27. *Mergus serrator* Linnaeus RED-BREASTED MERGANSER.

Eskimo: (Nunatamio): ARPARSAYOAYOQ (the one that is running) (referring to its using the feet when getting on the wing).
(Kuvuk): PAKSUVUYUK (who says PAK).

A very common summer resident in the Mackenzie Delta, south as well as north of tree limit; breeding wherever found.

In 1930 Lang first observed the species on the Peel on May 30. On May 25, 1932 it was first observed at Kittigazuit, when a male was taken. On September 11, 1933 a female with a brood of six almost full-grown young was taken near Tununuk. On October 2, 1934 an adult male and a juvenile female were taken near Tununuk in a small creek. The crop of the male contained about 40 ten-spined sticklebacks. On October 8, 1934, a flock of Mergansers was seen near the Reindeer Station. In 1935 the species was very common; first recorded on June 10.

In the Delta the Merganser prefers small creeks and rivers with clear water, flowing from large lakes or from the hills.

Four specimens were prepared, taken from May 25 to October 2.

28. *Astur atricapillus atricapillus* (Wilson). GOSHAWK.

Eskimo: KIGIAVIK or KIGILAVIK (application of name may be questionable, since the Eskimo do not seem to know the hawks well).

A fairly common resident in the Mackenzie Delta, presumably breeding wherever found.

An adult female, wingless, but otherwise complete, was given to me by Eskimo who said it had been killed on the East Branch,

January, 1933. He appeared to know the species well, and said it wintered in the Delta regularly and that it killed many ptarmigan. On June 17, 1934, an adult was observed near the Reindeer Station, eating a rabbit. A full-grown juvenile was taken on the lower East Branch, near the tree limit, on August 19, 1934. Lang took a juvenile of last year in a trap on March 29, 1934, and for a week in May observed a Goshawk in the vicinity of his camp, hunting birds and muskrats. One Goshawk was seen near the Reindeer Station on November 23, 1934, and another on Moose River on December 10. In 1935 on June 12 a female and 3 downy young were taken from a nest 25 feet up in a leaning spruce in dense forest. The crops contained parts of a squirrel.

Two adults, June 12 and January, two immatures, March and August 19; and 3 small downy young June 12 were collected.

29. *Buteo lagopus s. johannis* (Gmelin) AMERICAN ROUGH-LEGGED HAWK.

A common summer resident of the Mackenzie Delta, nesting wherever found. The Rough-leg is the commonest hawk of the Delta and the barrens to the east.

Early spring records are: 1933, May 24; 1935, May 7. A nest containing 3 eggs was found near Campbell Lake on June 14, 1927; another with two downy young was found below Nels Holm's Point. Nest sites were on points or crevices of river bluffs or cut banks. The latest fall records are Oct. 4 to 9, 1934.

Three specimens were collected, June 17 to August 2.

30. *Aquila chrysaetos canadensis* (Linnaeus) GOLDEN EAGLE.

Eskimo: TINGMIARPAK (the big bird).

A fairly common summer resident of the Mackenzie Delta, breeding here and there, but nests not very common.

From Aklavik Indians I obtained in 1927 the head and neck of an adult Golden Eagle, taken near Aklavik.

In June, 1927, a nest in all probability of this species was seen on a rocky ledge by a small lake north of Campbell lake. During six or seven trips across the Delta, during the summer of 1934, one or two Golden Eagles were seen on each trip, probably the same birds. In 1934, Lang first observed the Golden Eagle on the Peel, on April 8. Each year he had seen a pair of birds about the nest near the mouth of the Willow River, where one or two nests were seen on inaccessible ledges on

mountain walls. One bird appeared to be on the nest on April 20, 1934. Lang killed one Golden Eagle in May, 1930, eating a freshly killed muskrat.

31. *Haliaeetus leucocephalus alascanus* Townsend
NORTHERN BALD EAGLE.

Eskimo: KILERAK.

A common summer resident in the Mackenzie Delta, breeding north to the tree-limit, but may be seen north to the Arctic Ocean. I have records of about two dozen nests in the Mackenzie Delta.

From personal observation I have found that Bald Eagles in the Delta prey on rabbits, muskrats, various birds and fish.

In 1934, Lang first observed the Bald Eagle on the Peel on April 7. In 1933 Lang observed six different nests in his vicinity.

The Bald Eagle is one of the first migrants to arrive and in 1935 was first observed on April 23, long before the river ice broke.

32. *Falco rusticolus obsoletus* Gmelin BLACK
GYRFALCON.

A common resident of the Mackenzie Delta, nesting wherever suitable sites are available. The species is more common north of the tree limit, at least during the nesting season, than in the wooded parts of the Delta.

During the winters I have, on two or three occasions, seen the Gyrfalcon take ptarmigan on the wing.

Two specimens taken Sept. 18, 1934, are in a grey plumage.

The White Gyrfalcon was not observed.

33. *Falco sparverius sparverius* Linnaeus
EASTERN SPARROW HAWK.

In 1935 during May and June Sparrow Hawks were frequently observed on the East Branch near the Reindeer Station.

34. *Canachites canadensis osgoodi* Bishop
ALASKA SPRUCE GROUSE or PARTRIDGE.

Eskimo: ITUKTOQ or QILINGAQ.

A somewhat rare and apparently irregular winter visitor to the Mackenzie Delta; I never observed it in the eastern part.

Lang found the Spruce Grouse on the Peel Branch during the years 1930 and 1933, but failed to see any in 1934. More birds were seen in 1932 than in any other year. Lang gave me one pair taken on the lower Peel in March, 1933, of which I made specimens. I have no records of nests or eggs.

The species had previously not been recorded farther north in the Mackenzie basin than Great Bear Lake.

35. *Lagopus lagopus lagopus* (Linnaeus)
WILLOW PTARMIGAN.

Eskimo: AQGILAK.

The Willow Ptarmigan of the Mackenzie Delta may hardly be called migratory. It breeds in great abundance in the Barrens east of the Delta, particularly in the upland tundra of the Caribou Hills. In December large flocks move to the Delta and throughout the winter feed in the large willow flats of the alluvial delta islands. In April flights back and forth between the willow flats and the hills are made daily and the nights are spent in the willows. The birch groves on the East Branch during the winter also are favorite haunts of the ptarmigan, and some trees are almost stripped of buds. Some ptarmigan, however, remain all winter on the barrens.

A nest with 9 slightly incubated eggs was found near Kittigazuit, on May 31, 1932. On and shortly after June 20-21, 1933, numerous males with but the heads and necks brown, were seen on the barrens, east of the Reindeer Station, when a nesting female was also seen. On June 28, 1934, a nesting female was seen. On July 24, 1934, several broods of fledglings were seen at King Point. In normal years two broods are perhaps usual, and females accompanied by two flocks of young of different size are often observed.

The food of the Willow Ptarmigan, during summer consists chiefly of the leaves of *Vaccinium uliginosum* and *V. Vitis-Idaea*, with the seed of *Dryas*, *Polygonum* etc. In August and September berries are taken, and during the winter and spring willow and birch buds are the principal food.

Willow Ptarmigan from year to year vary tremendously in numbers although I have not noticed definite cycles. I think that the weather during the spring determines whether one or two broods are reared. It was very abundant at Kittigazuit during the winter of 1931-32. A very heavy fall of snow early in June 1932 destroyed many nests.

I believe that at least during part of the winter the males separate from the females; at any rate far more males are taken in the Delta during winter and on many occasions 6 or 7 birds from a flock have all been males.

Four specimens were prepared, taken from June 28 to July 21.

36. *Lagopus rupestris rupestris* (Gmelin)

ROCK PTARMIGAN

Eskimo: NIKSAKTUGAQ.

A somewhat rare winter visitor, in the Mackenzie Delta rarely seen south of the tree limit, and probably not breeding in the Delta or the Eskimo Lake basin. Clarke, however, saw them on the coast at Warren Point in the summer of 1942.

It was fairly scarce at Kittigazuit, November 1931, when five were shot. It was occasionally seen during the winter of 1931-32, generally in company with Willow Ptarmigan. From October 1-3, 1934, flocks of from 4 to 30 birds were seen daily near the seashore east of Kittigazuit, and appeared to have arrived from islands to the north. While the Willow Ptarmigan at that date had not completed its moult, the Rock Ptarmigan were entirely white. A male and a female were shot from a flock of seven Willow Ptarmigan.

The footprint of this species is much smaller than that of the Willow Ptarmigan. The note and mating call of the Rock Ptarmigan is very distinct from that of the Willow Ptarmigan.

37. *Lagopus leucurus peninsularis* Chapman

KENAI WHITE-TAILED PTARMIGAN

During March, 1934, the species was observed twice on the East Branch near the Reindeer Station when first a pair and later five were detected on the hillside. The actions appeared to be somewhat different from those of the Willow Ptarmigan. No specimens were taken, but as the birds passed me at close range in flight there appears to be little possibility of mistake.

38. *Grus americana* (Linnaeus) WHOOPING CRANE.

The Whooping Crane used to occur at Fort Anderson (Preble p.312). One Delta native, Douglas Oniak who is probably 60 years old told me that he and most of the older natives knew this bird well, but had not seen it for a long time.

39. *Grus canadensis canadensis* (Linnaeus)
LITTLE BROWN CRANE.

Eskimo: TATILIGAK (from the voice).

A somewhat rare summer resident, breeding only in the most inaccessible parts of the Barrens north and east of the Delta; according to the Eskimos it was formerly more common.

In 1932 the species was first observed at Kittigazuit on May 8, when a pair was seen

on the hills, picking berries from last year's crop; several pair were seen during the month. In June the species moved on towards the east. In 1933 cranes were reported on the Middle Branch, above the tree limit on May 9. Cranes have not been observed in the Delta during the fall migration.

This bird is much sought in the spring, and it is believed that many are killed during the spring migration.

The nest apparently is not known to the Eskimo of the Delta.

In 1935 it was first observed on the East Branch on May 11, when 11 birds were seen; on May 15 three flocks totalling 50 birds were seen; on Aug. 6 and 16 one pair was seen on the North end of Richards Island.

Two specimens were taken on May 24.

40. *Charadrius semipalmatus* Bonaparte
SEMI-PALMATED PLOVER.

Eskimo: TALIVIAK.

A common summer resident along the Arctic coast and the Eskimo Lakes, breeding wherever found; rare in the wooded parts of the Delta.

In 1932 the species was first observed on the tundra bank of Kittigazuit on June 1; in 1935 it was first seen on June 10. Numerous small flocks of from 2 to 6 birds were seen at Kittigazuit, September 30-October 2, 1934.

Four adults were taken June 10 to July 26; a half grown young on July 28.

41. *Pluvialis dominica dominica* (Müller)
AMERICAN GOLDEN PLOVER.

Eskimo: TULIK? (from the voice).

A common summer resident on the barrens north and east of the Mackenzie Delta, probably breeding wherever found; rarely, if ever, observed during the summer in the wooded parts of the Delta. In this district its principal breeding grounds are on the rather dry upland tundra of the Caribou Hills and Richards Island in company with the Hudsonian Curlew and the Long-tailed Jaeger.

In 1932, the species was first noted at Kittigazuit, on May 21, when a few birds were seen. A week later the species was very common. In 1935 it was first seen on May 24.

The species has not been detected in the Delta in fall migration.

42. *Arenaria interpres morinella* (Linnaeus)
RUDDY TURNSTONE.

My only records are two skins given to me by a native who said the birds had been

killed on May 23, 1932, near Kugaluk river in the Eskimo Lake basin.

Clarke saw this species in migration at Tuktoyaktuk on August 12 and 13, 1942. On August 17 he saw two young, nearly fully fledged and able to fly, at Cape Bathurst sandspit.

43. *Capella delicata* (Ord) WILSON'S SNIFE
Eskimo: AIVAKTAYAQ or OKUKIAQ.

A common summer resident on the western side of the wooded part of the Delta; less common on the east side of the Delta. North of the tree limit the species has been observed but once or twice. Clarke saw a female and 3 downy young at Aklavik on July 19, 1942.

It was first observed on the Peel in 1934 during the latter part of May (Lang); common between Aklavik and the Schooner Channel, June 2-12, 1934, although not nearly as common as in the previous year. In 1935 it was first seen on June 1 and became common by June 6. A nest was reported, but not seen by me, near Aklavik. At Aklavik during the latter part of May and early part of June its flight song was heard during the 24 hour day.

One specimen was collected on June 10, 1932.

44. *Phacopus hudsonicus* (Latham)
HUDSONIAN CURLEW.

Eskimo: SIYUK or SIYUKTUAQ (referring to long bill; SIYUK - bill).

A common summer resident, breeding on the dry upland tundra of the Caribou Hills and Richards Island.

In 1932 it was first observed on May 21, when a female contained one fully-developed egg. In 1923 it was first seen on June 7; in 1935 on May 24.

On a six-mile trip over the tundra east of the Reindeer Station from June 20-21, 1934, an average of three birds were in sight all the time. The species has never been observed in fall migration.

Four adults were collected from May 29 to June 20.

45. *Actitis macularia* (Linnaeus)
SPOTTED SANDPIPER.

Eskimo: TUSATUSAQ.

A common summer resident, breeding abundantly in the wooded part of the Delta, but rarely seen north of the limit of trees.

This bird is rarely seen on lakes and prefers the muddy banks of small rivers, where a pair is generally found around each bend.

The earliest record in 1935 was on May 29.

A female taken on the East Branch, on June 16, 1934, contained a fully developed egg. A nest containing four eggs in an advanced state of incubation was taken with the parent bird, on the upper East Branch July 12, 1934. The nest was made in clay on a barren river bank; it consisted merely of a slight depression lined with dried roots of *Equisetum*. In the same place, on July 14, a pair was seen with three or four downy young.

A female was taken on June 16.

46. *Tringa solitaria cinnamomea* (Brewster)
WESTERN SOLITARY SANDPIPER

Recorded in late May and June. One stomach examined contained achenes of *Ranunculus lapponicus*.

Four specimens were taken from late May to June 11. A pair seen by Clarke at Aklavik July 17-21, 1942, behaved as though it was nesting.

47. *Totanus flavipes* (Gmelin)
LESSER YELLOW-LEGS.

A very common summer resident in the Mackenzie Delta, breeding abundantly in the wooded parts of the Delta, and perhaps sparingly north, almost to the Arctic Ocean.

Two pairs were seen at Kittigazuit June 1, 1932. In 1933, the species was first observed at the Reindeer Station, on June 7, while in 1934, it was first seen in this place on June 9. On June 29, a nest containing four eggs was discovered on the ground under low bushes in open birch forest on the East Branch. On July 5 the eggs were hatched and the young had left the nest. In 1935 it was first noted at the Reindeer Station on May 24. Newly hatched young were seen by Clarke at Aklavik on July 21, 1942.

The Yellow-Legs has not been observed in fall migration.

Two specimens were taken on May 23 and June 1.

48. *Pisobia melanotos* (Vieillot)
PECTORAL SANDPIPER.

A common summer resident, breeding along the Arctic coast east of the Delta and on Richards Island.

Four specimens were taken on July 27 and August 3, 1927.

49. *Pisobia bairdi* (Coues)
BAIRD'S SANDPIPER.

A fairly common summer resident, breeding north of the tree limit. I have never observed the bird in the wooded part of the Delta.

In 1932 it was first observed on May 21.

The National Museum catalogue shows that two specimens collected July 28 were received and discarded.

50. *Micropalama himantopus* (Bonaparte)
STILT SANDPIPER.

Clarke, while in company with Dr. Arthur Twomey of the Carnegie Museum, Pittsburgh, U.S.A., saw two Stilt Sandpipers at Tuktoyaktuk, July 24, 1942.

51. *Ereunetes pusillus* (Linnaeus)
SEMIPALMATED SANDPIPER.

A very common summer resident, breeding commonly on the islands north of the Mackenzie Delta and on the Arctic coast east of the Delta.

During July and August the Semipalmated Sandpiper is often seen in small flocks, particularly during the early morning hours, feeding on the only too abundant mosquitos. It appears that the mosquitos, especially on cool nights, remain down amongst the vegetation.

A specimen was taken on July 28, 1927.

52. *Tryngites subruficollis* (Vieillot)
BUFF-BREASTED SANDPIPER.

One male was taken at Atkinson Point east of the Mackenzie Delta, on August 3, 1927.

53. *Crocethia alba* (Pallas) SANDERLING

A transient; may breed on the Arctic coast east of the Delta and on Richards Island. Recorded in June and September. Clarke saw 3 on August 17, 1942, at Cape Bathurst sand-spit.

A specimen was taken on Sept. 16, 1934.

54. *Phalaropus fulicarius* (Linnaeus)
RED PHALAROPE.

Lang collected one on June 9, 1935 on the Peel Branch.

55. *Lobipes lobatus* (Linnaeus)
NORTHERN PHALAROPE.

A common summer resident, breeding abundantly on the Barrens east of the Mackenzie Delta. The species was rarely seen in the Delta in the spring, and not in the fall migration.

It was first seen at Kittigazuit on June 1 in 1932; in 1935 on May 23 near Husky River; and on the Peel Channel on June 2, 1935. In July, 1927 large swarms of these birds were seen about the large lakes inland from Kittigazuit.

Six specimens were taken on June 1 to July 28.

56. *Stercorarius pomarinus* (Temminck)
POMARINE JAEGER.

Eskimo: ISUNGAQ or ISUNGATSIQA are probably used indiscriminately for the Pomarine and Parasitic Jaegers.

The Pomarine Jaeger is less common than the other two Jaegers.

Lang recorded the species in July, 1934 on the lower East Branch; in 1935 it was seen at the Reindeer Station the first week in June, and Lang took two specimens on June 11 and 13 on the Peel Branch. Clarke observed it at Tuktoyaktuk, August 11-14, 1942.

57. *Stercorarius parasiticus* (Linnaeus)
PARASITIC JAEGER.

Eskimo: ISUNGAQ or ISUNGATSIQA (see notes under *S. pomarinus*).

ISUNGARALUK (used for the dark phase).

A common summer resident, breeding in the barrens north and east of the Mackenzie Delta; casual in the wooded part of the Delta. Lang took two specimens in July, 1934.

58. *Stercorarius longicaudus* Vieillot
LONG-TAILED JAEGER.

Eskimo: KULUVARTALIK (the one with the tail). ISUNGAQ is also used for this species.

A common summer resident, probably breeding only in the barrens north and east of the Mackenzie Delta, where it frequents the high, dry upland tundra.

The earliest arrival date was June 1, 1935 at the Reindeer Station. The species was found nesting June 18-23 in 1927 inland from Kittigazuit, and almost full-grown young were seen on July 8; on Richards Island young unable to fly were seen on July 21. A few were seen on Oct. 1, 1933, on the lower East Branch. Two specimens were taken in July, 1934.

59. *Larus hyperboreus barrovianus* Ridgway
GLAUCCOUS GULL.

Eskimo: NAUYAQ (this name is used indiscriminately for this as well as for the Herring Gull).

A common summer resident on the Arctic coast north and east of the Delta, breeding abundantly. The species is of casual occurrence within the Delta in spring and fall. A colony of about 500 birds nested on a limestone promontory in Campbell Lake. Large colonies of breeding Glaucous Gulls were seen in 1927 on small islands in lagoons and large lakes along the coast and on the Eskimo Lakes At Cape Dalhousie, on Aug. 11, the juveniles

still remained close to the nest, while on a small island in Setidgi Lake, the young on August 21 were full fledged.

In 1935 it was first seen at the Reindeer Station on May 15; in 1934 it was common on the Big River from Oct. 4 to 9.

Five specimens were taken in July and August. The wing measurements of two adult males are 410 and 440, of a female 412 mm; the bill measurements are male 57, 58, female 55 mm.

60. *Larus argentatus* subsp. HERRING GULL.

Eskimo: NAUYAQ (see notes under *L. hyperboreus*).

A common summer resident, breeding in the wooded part of the Mackenzie Delta.

The Herring Gull is perhaps the most common gull in the Mackenzie Delta and with the Short-billed Gull, with which it is often associated, acts as a scavenger near human habitation.

The earliest record in the Delta was on May 8, 1932.

61. *Larus philadelphia* (Ord).

BONOPARTE'S GULL.

Eskimo: QALIGALIGAQ.

A regular, but not very abundant summer resident, breeding in the wooded part of the Mackenzie Delta, rarely seen north of the tree limit.

In 1927 the earliest seen was on May 25, near Aklavik; in 1935 at the Reindeer Station on June 10.

One specimen was taken on June 1, 1934.

62. *Larus canus brachyrhynchus* Richardson
SHORT-BILLED GULL.

Eskimo: NAUYATSIAQ (a small NAUYAQ).

A common summer resident, apparently breeding abundantly in the wooded part of the Mackenzie Delta; somewhat rare north of the tree limit.

It often associates with the Herring Gull, and with that species is found in large numbers along the waterfront at Aklavik feeding on the garbage dumps.

The Eskimo of the Delta state that the nest of the Short-billed Gull is generally found in spruce trees leaning over water, more commonly on the lakes than on riverbanks; sometimes the nest is found in deadfalls near the shores of lakes. I have never seen a nest, but in August juveniles are very commonly seen in the flocks. Clarke saw a nest with two

downy young on a stump in a slough at Aklavik, July 18, 1942.

The latest seen was a single bird on the Big River, near the Reindeer Station, on Oct. 7, 1934.

Five specimens were taken from June to July 12.

63. *Xema sabini* (Sabine) SABINE'S GULL.

A regular, but somewhat rare summer resident, breeding on the north end of Richards Island and on the Arctic coast east of the Delta.

I have not seen nests of this species, but the Eskimo assure me that it nests on the tundra on the north end of Richards Island and in a number of places on the coast between the Delta and Liverpool Bay.

Three immature specimens were taken from Sept. 12 to Oct. 20.

64. *Pagophila alba* (Gunnerus) IVORY GULL.

Tuktoyaktuk Eskimos described these birds to Clarke as occurring on the coast quite regularly in fall and winter, in leads and on the edge of the open water. Most of the birds seen are speckled young.

65. *Sterna paradisae* Brunnich ARCTIC TERN.

Eskimo: MITKUTAILAQ ("he has no needle" from the voice of the bird).

A very common summer resident, breeding abundantly in the wooded part of the Delta as well as on the barrens.

The first birds were observed at Kittigazuit on May 25, 1932; in 1934 Lang first saw the species on the Peel on May 27; at the Reindeer Station in 1935 it was common on June 10.

It nests in the Delta on low, grassy river banks or points in small colonies of from 2 to a dozen birds. On the barrens nesting colonies are often found on small islands in the tundra lakes. Nests with eggs in advanced state of incubation were found on the Barrens on July 11 and 21, 1928. Clarke saw downy young at Aklavik on July 20, 1942.

An adult was collected in July 1934 by Lang.

66. *Aethia pusilla* (Pallas) LEAST AUKLET.

One bird was found on the ice, near the village of Kittigazuit, May, 1927, by natives. The bird was unknown to the Mackenzie Eskimo.

This appears to be the only record east of Point Barrow, and to have been the basis for the A.O.U. Checklist statement of casual occurrence at the Mackenzie Delta.

67. *Bubo virginianus* subspecies

GREAT HORNED OWL.

Eskimo: NUGISSAGAQ (? the very strong).

Fairly common in the Mackenzie Delta where it is a resident throughout the year in the timbered parts; occasional or rare beyond the limit of trees.

It was frequently seen during the winter of 1934-35 including one on Dec. 22 far north of timber.

Two specimens collected on Oct. 28 and Nov. 1 are listed as *subarcticus* x *saturatus* by Taverner (1942, *Auk*, 59, p. 243).

68. *Nyctea nyctea* (Linnaeus) SNOWY OWL.

Eskimo: UGPIK.

Very common in the Delta and to the eastward, feeding largely on the ptarmigan and rabbits. Near Kittigazuit, on a ptarmigan snare line, owls in one night cleaned up 8 ptarmigan caught in the snares. Snowy Owls were very abundant and destructive at the Reindeer Station during the winter of 1932-33. Through the winter of 1933-34 but one bird was seen in the vicinity of the Station. Two birds were seen on Richards Island in Jan., 1934. Lang says that Snowy Owls are destructive to traplines because of damage to fur in traps.

One specimen was taken on Dec. 4, 1931.

69. *Surnia ulula caparoch* (Müller)

HAWK OWL.

Eskimo: NIAQORTUARAJUK (he has a medium-sized head).

A common resident of the Mackenzie Delta. In winter often seen perched on the tops of flag poles or radio masts near settlements.

Five specimens were taken, on January 31, March 25, June 11, October 11, and November 9.

70. *Asio flammeus* (Pontoppidan)

SHORT-EARED OWL.

Several were seen by Clarke, at Tuktoyaktuk, July 24-August 12, and at Aklavik, September 26-27, 1942.

71. *Colaptes auratus luteus* Bangs

NORTHERN FLICKER.

Eskimo: TUJUKPAQ (big TUJUK = Woodpecker; Tujuk can also mean Plover).

Found occasionally in the higher wooded parts of the Mackenzie Delta where it breeds.

It was first observed on the East Branch, near the Reindeer Station in the latter part

of May, 1933. The following year but one bird was seen. In 1935 it was more common than in the previous seasons, and seen off and on after the end of May. On June 24 a nest was seen in a dead spruce, 15 feet above the ground.

72. *Picoides tridactylus fasciatus* Baird
ALASKA THREE-TOED WOODPECKER.

Eskimo: TUJUK.

An irregular permanent resident; not very common in the Delta. A few were seen on the Peel River the winter of 1927-28 during December and January; first seen on the East Branch March 15, 1933, although we had been looking for it all winter; fairly common at the Reindeer Station in April, 1932; one seen at the Station on January 24, 1935.

One specimen was taken on June 10, 1935.

73. *Sayornis saya saya* (Bonaparte)

SAY'S PHOEBE.

One pair was seen at Kittigazuit on May 22, 1932, and in early June had almost completed a nest on a cornice of a log building. Following a three days snowstorm during which the nest was completely covered with snow it was deserted on June 12 and one bird was found dead on June 9. It was not observed in the Delta in subsequent seasons.

74. *Empidonax trailli* (Audubon)

ALDER FLY-CATCHER.

Clarke heard this species at Aklavik July 18, 1942.

75. *Otocoris alpestris hoyti* Bishop

HOYT'S HORNED LARK.

This bird appears to be rare in the Delta, but may be common in the open country to the east; first observed at Kittigazuit on May 28, 1932. It was not observed at the Reindeer Station on the East Branch during the spring and summer of 1933.

76. *Riparia riparia riparia* (Linnaeus)

BANK SWALLOW.

Very common in the Delta and nesting far beyond the tree limit. A few birds nested near Kittigazuit where one was found killed by a sand slide. Several large colonies seen near the Reindeer Station on June 21, 1933. It was also found nesting in 1934 and 1935.

One specimen was taken on June 16, 1932.

77. *Petrochelidon albifrons albifrons* (Rafinesque) NORTHERN CLIFF SWALLOW.

Several large colonies of Cliff Swallows were nesting on limestone cliffs on Campbell

Lake, east of the Delta. Some of the lower nests had been reached by the spring high water. Suitable nesting sites are wanting elsewhere in the Delta. I have never observed this species to build nests on buildings anywhere in the Delta.

78. *Perisoreus canadensis canadensis* Linnæus CANADA JAY.

Eskimo: KEELEQ.

Very common in the wooded part of the Delta throughout the winter and spring until the nesting season when it is hardly ever seen. During August when the young are full-grown it again returns to the camps. It was occasionally seen in the Delta north of the tree limit.

Lang told me that he saw full-grown young on June 15, 1932 and that hundreds of these birds were killed each year in traps set for fur animals.

79. *Corvus corax principalis* Ridgway

NORTHERN RAVEN.

Eskimo: TULUVAQ.

Ravens are common in the Delta in winter and nest there, formerly living principally on the rabbits. Following the establishment of the Reindeer Herd in the Mackenzie ravens became very plentiful and probably were attracted from afar. Besides doing some useful scavenging the ravens did much damage by devouring meat cached without protection; also occasionally ravens successfully attack young reindeer fawns.

Lang reported a nest with full-grown young in the top of a spruce tree, on June 1, and on other occasions having seen juvenile birds. He considers the raven a most destructive bird which does much damage to fur caught in traps.

80. *Penthestes cinctus* (Boddaert) subsp.

SIBERIAN CHICKADEE.

Clarke found this species at Aklavik in 1942 to be equal in numbers to the Hudsonian Chickadee. One was collected on September 19 (National Museum of Canada). At the Reindeer Station he found only the Hudsonian Chickadee.

81. *Penthestes hudsonicus hudsonicus*

(Forster) HUDSONIAN CHICKADEE.

A common resident of the Mackenzie Delta; in most winters it may be seen even some distance north of the limit of trees. (Tununuk in January and again in March, 1928, 20 miles beyond the tree limit, feeding on the seeds of alder.)

It was common at the Reindeer Station on the East Branch during the autumn when large flocks appeared. None was seen here during the winter of 1934-35 although a few were seen at Aklavik on Feb. 7; on April 23 the bird again appeared commonly, feeding on seeds of paper birch.

Chickadees are rarely seen in the delta during the summer although Lang told me that some stayed near his cabin all summer on the Peel Branch.

Apparently this species had not been recorded previously farther north on the Mackenzie than Fort Good Hope.

82. *Turdus migratorius migratorius* Linnaeus

EASTERN AMERICAN ROBIN

Very common in the Mackenzie Delta and breeding abundantly to the limit of trees and less commonly some distance beyond.

The earliest arrival noted was on May 17, 1932 at Kittagazuit while on the East Branch the first robin was noted on May 15 in 1934.

Robins were scarce in the Delta in 1933 because after an early spring a late snow storm covered the ground with 12 inches of snow, and nearly all the robins, varied thrushes etc., perished. During the following summer not one nesting bird was seen on the East Branch. In 1934 it was first noted on May 15; on June 19 a nest with 4 newly hatched young was found. Another nest with young was seen on June 29, on the ground. In 1935 it was still scarce on the lower East Branch but was decidedly more abundant near the head of the Delta.

An adult male was taken on May 7, 1932.

83. *Ixoreus naevius meruloides* (Swainson)

NORTHERN VARIED THRUSH

Fairly common in the Mackenzie Delta and breeding on the East Branch and on the Peel River to some distance south of the limit of trees.

In 1935 it was first observed on the East Branch on June 4; large numbers died from starvation and exposure following a snowstorm which completely covered the ground to a depth of 12 inches. In 1934 the first birds were seen on June 19, but no nests were seen that season and the birds were very scarce. In the upper Delta it was less scarce, nesting in *Larix* swamps. In 1935 two birds were seen on May 24; by June 10, they were fairly common. The bird is often seen in top of spruce trees uttering a despondent, mournful "tsyy tsyy."

Lang reported it nesting on the Peel Branch where the earliest date on which he saw it

was May 19, 1934. Clarke saw one at Aklavik on September 20, 1942.

Four males and a female collected between June 4 to August 27 are this race.

84. *Hylocichla minima aliciae* (Baird)

GREY-CHEEKED THRUSH

I took one female, wing 97 mm. in length, on June 9, 1933. Clarke found this species fairly common at Aklavik in July, 1942.

85. *Anthus spinoletta rubescens* (Tunstall)
AMERICAN PIPIT.

A common summer resident probably breeding north of the limit of trees.

The earliest record was May 17, 1932 at Kittigazuit when many were seen.

Three specimens were taken; May 17, August 6, and August 16.

86. *Bombycilla garrula* (Linnaeus)

BOHEMIAN WAXWING.

At Aklavik, July 17-21, 1942 Clarke found this species common.

87. *Lanius borealis invictus* Grinnell

NORTH-WESTERN SHRIKE.

Lang reported this bird on the Peel Branch; I never saw it.

88. *Vermivora peregrina* (Wilson)

TENNESSEE WARBLER.

Clarke heard this species at Aklavik, July 18-19, 1942.

89. *Vermivora celata orestera* Oberholser
ORANGE-CROWNED WARBLER.

Fairly common on the upper East and on the Peel Branch where it no doubt breeds.

An adult female taken on May 31, 1935 was referred to this race because of the lack of grey on the head, and a wing length of 60 mm.

90. *Dendroica aestiva amnicola* Batchelder
NORTHERN YELLOW WARBLER.

Eskimo: PIORAQ (?).

Rather common in the Mackenzie Delta and breeding in the higher parts not subject to spring flood.

One male was taken on June 12, 1934 and another on June 26, 1935.

These are referable to the darker northern bird, ranging across Canada for which Oberholser (1938, *Dept. of Cons., State of Louisiana*, Bull 28, p. 530) uses this name. In view of its distribution "Northern" rather than "Newfoundland" Yellow Warbler seems a more appropriate vernacular name.

91. *Dendroica coronata* (Linnaeus)

MYRTLE WARBLER.

Rather common on the upper East Branch and on the Peel but rarely seen in the lower parts of the Delta which are flooded in the spring.

In 1935 it was first observed at the Reindeer Station on May 24 when 3 birds were seen. Clarke saw fledglings at Aklavik, July 18, 1942.

Three specimens were taken; June 2 and 10 and August 30.

92. *Dendroica striata* (Forster)

BLACK-POLL WARBLER.

Perhaps the most common warbler on the upper East Branch where its earliest arrival has been noted as May 29. It is most often found in dense alder thickets in gullies and ravines; nesting some distance beyond the tree limit.

On July 12, 1934 one pair was observed feeding on mosquitoes off alder leaves; the nest evidently was nearby although it was not seen. On July 22 one pair was seen near Tununuk in an alder thicket obviously feeding young. On August 16 a nest was seen in an alder bush on the south end of Richards Island; it contained many small feathers and was lined with the down of *Epilobium* and willow, and was near the water's edge.

An adult male was taken on Richards Island on July 22, 1934.

93. *Sciurus noveboracensis notabilis* Ridgway
GRINNELL'S WATER-THRUSH.

We saw this species in the Mackenzie Delta on the upper East Branch and on the Peel. The earliest record was May 31. Clarke found it common at Aklavik, July 17-22, 1942.

One specimen was taken on August 15, 1934.

94. *Wilsonia pusilla pileolata* (Pallas)

BLACK-CAPPED WARBLER.

Fairly common on the upper East Branch where no doubt it nests.

The earliest record is May 28, 1935.

Contrary to expectation an adult male taken on May 28 agrees with Alaska and British Columbia specimens, and not with the duller eastern bird.

95. *Euphagus carolinus* (Müller)

RUSTY- BLACKBIRD.

Fairly common in the Mackenzie Delta where it breeds to some distance beyond the tree limit. The earliest arrival noted at the Reindeer Station was on May 23, 1935 when

several birds were seen; first seen at Kittigazuit on June 1, 1932. Full-grown young were noted on the upper East Branch on July 12, 1934. One full-grown young bird was taken on the lower East Branch on August 19, 1934. On the Peel Branch it was recorded by Lang on May 14, 1934.

Three specimens were taken; Aug. 17, 13 and 25.

96. *Pinicola enucleator* subspecies

PINE GROSBELK.

We have recorded this species only as an occasional winter visitor to the Delta; when present apparently more common on the west than on the east side. On the Peel River Lang has noted it off and on from October to June. Clarke found it abundant at the Reindeer Station and Aklavik in September, 1942. I have never seen it during the summer. It was occasionally seen north of tree limit in alder bushes.

Two fragmentary skins taken on Nov. 22, 1937, were saved.

Acanthis species REDPOLL.

Eskimo: Koovuk Dialect: KAGSSAKELAQ.

In the field I did not distinguish between the two species (see below). Redpolls of one or both species were very common in the Delta in summer and winter. In winter, during prolonged spells of stormy weather it keeps out of sight only to re-appear on the first fine day even with the temperature at 50° below zero. In winter it was but rarely seen north of the tree limit. It feeds largely on the seeds of birch and alder.

It nests abundantly on the "Barren Grounds" and in the transitional area.

97. *Acanthis hornemanni exilipes* (Coxes)
HOARY REDPOLL.

Three specimens were collected; March 27, April 18, and in September. Clarke found this species abundant, July-October, 1942, but it was not observed within the forest zone during his stay there in July.

98. *Acanthis linaria linaria* (Linnaeus)
COMMON REDPOLL.

One specimen taken on June 3, 1935 was preserved. Clarke observed this species in both forested and unforested parts of the region, July-October, 1942.

99. *Passerculus sandwichensis anthinus* Bonaparte
SAVANNAH SPARROW.

Common in some years, rather scarce in others in the Mackenzie Delta where it has

been observed on the East Branch and on the Peel.

One male was taken on June 10, 1935; one was found dead on June 8, 1933 after a snow storm.

100. *Junco hyemalis hyemalis* (Linnaeus)
SLATE-COLOURED JUNCO.

Very common in the Mackenzie Delta and breeding abundantly well beyond the tree limit.

The earliest arrival noted was on April 29, 1932 at Kittigazuit while on the East Branch the first birds were observed on May 23, 1935.

In early spring large numbers of Juncos visited a feeding station in company with Fox Sparrows, White-crowned Sparrows and others. June 16-17, 1934 one pair was seen at a nest. The young were full-grown on August 5, 1934.

One specimen was taken on Sept. 20.

101. *Spizella arborea ochracea* Brewster
WESTERN TREE SPARROW.

Eskimo: SAKSAGAQ.

Very common in the Mackenzie Delta where it nests abundantly beyond the tree limit. The earliest arrival recorded was on May 23, 1935.

Two specimens were taken; May 24 and June 22.

102. *Zonotrichia querula* (Nuttall)
HARRIS'S SPARROW.

Rare or occasional in spring on the East Branch where in late May and early June it has been an infrequent visitor to a feeding station.

One pair was seen mating on May 27, 1935; it probably nests just east of the Delta.

A specimen taken May 27, 1925 was preserved.

This is an extension of the summer range of this bird, that hitherto was not known farther northwest than Great Bear Lake.

103. *Zonotrichia leucophrys gambeli* (Nuttall)
GAMBEL'S SPARROW.

One of the most common sparrows of the district; breeding in the Delta and to the eastward beyond the tree limit.

21, 1932, but was not very common until June 3. At the Reindeer Station it was rare on May 21, 1932, and became common by June 1. At

It was first observed at Kittigazuit on May the latter date it was feeding in large numbers with Juncos and Fox Sparrows at my feeding station. In 1935 the first bird was seen at the Reindeer Station on May 23 and nest building was seen on June 1.

104. *Passerella iliaca iliaca* Merrem

EASTERN FOX SPARROW.

One of the most common Sparrows in the Mackenzie Delta where it breeds well beyond the limit of trees.

The earliest arrival noted was on May 24, 1935. After a snow storm a few dead birds were found on June 4.

Three specimens taken June 6 and August 6 were preserved.

105. *Calcarius lapponicus alasensis* Ridgway

ALASKA LAPLAND LONSPUR.

Eskimo: PUTUKELUK.

A common spring and fall migrant in the Mackenzie Delta, nesting abundantly on the Arctic coast and on islands off the Delta.

It was first observed at Kittigazuit in 1932 on May 16; it was common here on June 3. Small flocks of both sexes were frequently seen at the feeding station on the East Branch early in June..

Two nests on Setidgi Lake, June 22, 1927, contained eggs ready to hatch. Juveniles still unable to fly were banded at Atkinson Point on Aug. 4, 1927.

Three specimens were collected on June 4 and July 24.

106. *Calcarius pictus* (Swainson)

SMITH'S LONGSPUR.

Clarke observed one at Nicholson Island on August 4, 1942.

107. *Plectrophenax nivalis nivalis* (Linnaeus)

EASTERN SNOW BUNTING.

Eskimo: AMAULIGAQ (Nunatamio Dialect UKIUTAULAQ (Koowuk) he says UKIU—meaning he speaks of winter) KALIGEUSAQ (Kittigazuit).

Common in spring and fall migration in the Mackenzie Delta, sometimes staying throughout mild winters, as that of 1927-28 when it was occasionally seen during December and January at Aklavik.

The earliest arrival recorded at the Reindeer Station was on March 30, 1933.

It nests abundantly on the Arctic coast and the islands off the Delta but never seen in the wooded parts during breeding season.

One specimen was taken on September 16.

NOTES AND OBSERVATIONS

SAW-WHET OWL AND FOOD RECOGNITION.—

Owls are traditionally birds of wisdom, evidently due to their appearance. Errington (1932, Wilson Bull., 44, pp.212-220), from a study of Great-horned Owls, decided that they were essentially birds of low intelligence. A Saw-whet Owl I had for a time this January (1943) did well on a diet of young mice, and even ate a dead bat. But when I put a piece of raw liver on the floor of its cage it did not eat it during the night. The next evening I filled a mouse skin with raw liver and put it in the owl's cage. In a few moments the owl flew down, lit on the meat-filled mouse skin and began to eat it. By morning all the liver and skin had been eaten.

The death of the owl prevented further experiments, but it appeared that the owl recognized the mouse skin as containing food, while it did not recognize the liver alone as food.

Probably the owl had learned to recognize certain kinds of food, but liver was outside its previous experience and it was not adaptable enough to try it at once.

Mr. Claude Johnson of the National Museum of Canada, tells me that he once kept a Saw-whet Owl for some months and it readily ate raw beef, so evidently some individuals are more adaptable than the one I had. —A. L. RAND, National Museum Canada, Ottawa.

TRENDS IN SOME CANADIAN CRETACEOUS SPECIES OF *INOCERAMUS* * †

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INTRODUCTION

IT IS PROPOSED in the following pages to consider the trends in the development of some Canadian species of *Inoceramus* during the later Lower Cretaceous and the Upper Cretaceous. The treatment is confined to species of the Canadian western interior.

An early attempt to establish genetic relations of species of *Inoceramus* was made by Geinitz¹ in 1871, but as only a few species were included in his scheme of evolution, no great importance can be attached to it. A more elaborate system, incorporating all of the British species, was worked out by Woods² in 1902. His 'Evolution of *Inoceramus* in the Cretaceous Period' is an outstanding contribution to stratigraphic palæontology. He relied mostly on changes in form and outline, but did not neglect the surface ornamentation. On the other hand, Heinz³, in 1928 stressed particularly the value of changes in surface ornament. He was, however, more concerned with the naming of new genera and subfamilies⁴ than with problems of descent. A simple classification like that of Heine⁵, involving only three categories, is only a convenient arrangement of species and is not intended to be a genetic system.

In the present stage of our knowledge, an attempt to solve the trends in Canadian *Inoceramus* can only be introductory and exploratory.

All the species have not been described and more needs to be known concerning the stratigraphic range of many species. More collecting and field studies are required.

Only a well preserved specimen of *Inoceramus* can be satisfactorily identified. The complete outline, surface contours and surface ornament should be known.

It is convenient to have a temporary nomenclature for outline of shell. The names proposed, however, are not intended for permanent adoption but only for this paper. A shell with an "erect" outline has an erect, not oblique outline, a mostly convex, erect, not oblique, anterior margin, subterminal beaks, a short anterior area, if any, and an erect, or at least little oblique, posterior margin. A shell with a "pernoid" outline has an erect, not oblique outline, an erect, long, straight or concave anterior margin, terminal beaks, anteriorly curved umbones and mostly a long, or even concave, anterior area. A shell with an "oblique" outline has posteriorly sloping anterior and posterior margins which with the hingeline enclose angles of less than ninety degrees. A shell with an "oblique-mytiloid" outline has an oblique outline with oblique anterior margin, probably convex below but straight or concave above, oblique posterior margin, long anterior area and terminal beaks and umbones, projected anteriorly. A shell with an "oblique-modioloid" outline has an oblique convex anterior margin, an oblique posterior margin, a short anterior area and subterminal beaks.

In figure 1 the species discussed are arranged stratigraphically and, so far as possible, genetically.

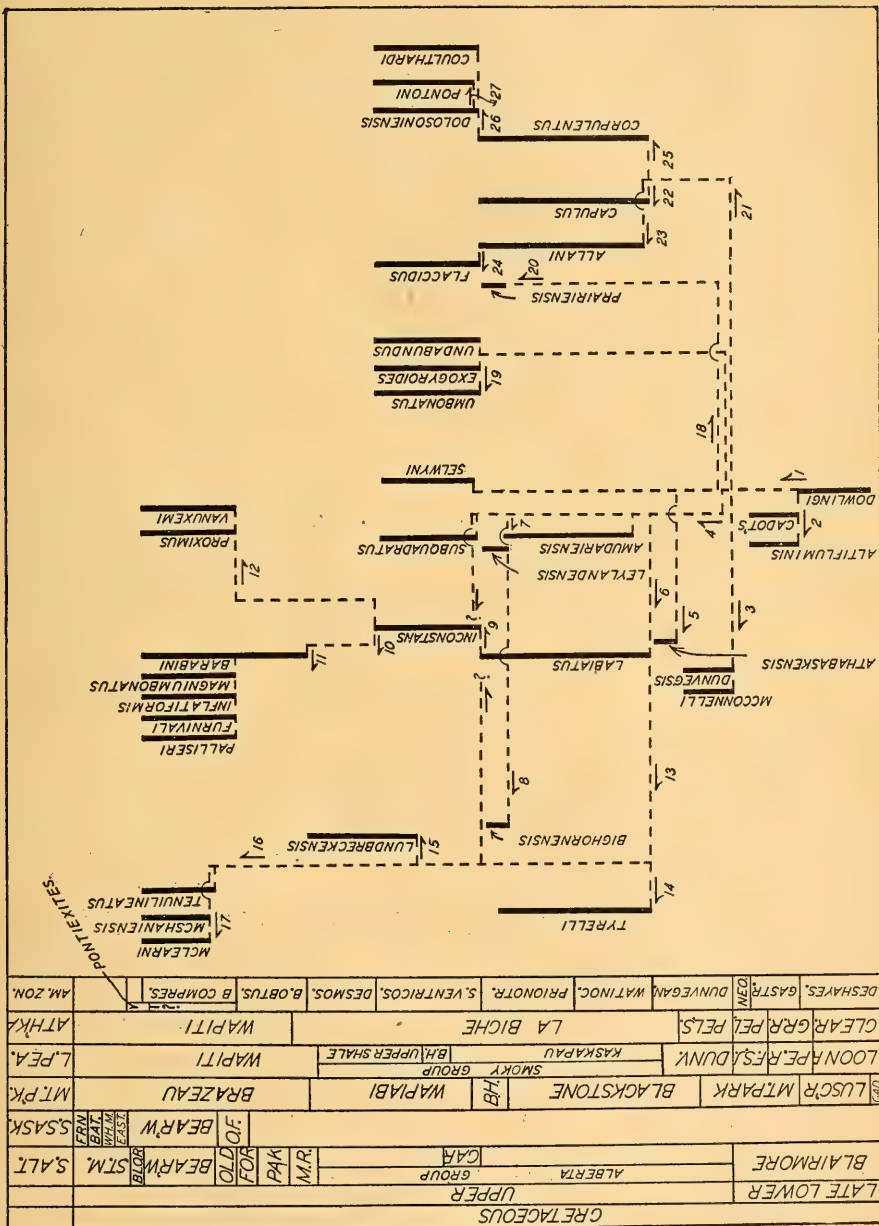
The writer is indebted to Dr. John B. Reeside, Jr. for numerous plaster casts of American species of *Inoceramus*.

* —Published with the permission of the Director, Mines and Geology Branch, Dept. Mines and Resources, Ottawa.

† —Received for publication, March 12, 1943.

1. —Geinitz, H. B., Palæontographica, Band 20, pt.2, p. 22, 1871.
2. —Woods, Henry, Quart. Journ. Geol. Soc. Lond., vol. 68, pp. 1-20, 1902.
3. —Heinz, R., Mitt. Min. Geol. Staatsinst., Heft 10, pp. 1-39, Hamburg, 1928.
4. —Heinz, R., Mitt. Min. Geol. Staatsinst., Heft 13, pp. 1-26, Hamburg, 1932.
5. —Heine, F., Abhandl. Preuss. Geol. Landesanst., N.F. Heft 20, pp. 1-124, Berlin, 1929.

FIGURE 1



LOWER CRETACEOUS STEM

Woods in his "Evolution" cites two species from the British Lower Cretaceous which he considers ancestral to two Upper Cretaceous branches of the genus. They are *I. neocomiensis* d'Orbigny from the lower Greensand of Aptian age and the later *I. anglicus* Woods from the Gault and Upper Greensand, of Albian age. This succession of species is paralleled in western Canada by *I. dowlingi* McLearn from the *Deshayesites* fauna of the Clearwater shale and the later *I. cadottensis* McLearn from the *Gastrolites* fauna of the Upper Sandstone or Cadotte member of the Peace River formation and from the lower part of the Fort St. John formation in the Peace River canyon. They have the erect to somewhat pernoid outline and the regular, evenly spaced, concentric ornament, characteristic of the species of the Lower Cretaceous "stem".

In Canada there also appears degeneration of ornament, not recorded from British localities. This begins to show in *I. cadottensis* and is marked in *I. cadottensis* var. *altifluminis* n. var. This variety occurs in the *Gastrolites* fauna from the lower part of the Fort St. John formation at the mouth of Deep creek in the Peace River canyon.

UPPER CRETACEOUS CHANGES IN OUTLINE AND ORNAMENT

With the beginning of the Upper Cretaceous there were important changes. One trend was toward a more frequent branching into lateral, parallel stocks. Another was toward a greater variety of outline. The erect and pernoid outlines became more distinctly differentiated and the oblique outline appeared, first the oblique-modioloid and later the oblique-mytiloid outline. Yet another trend was toward a more complex, and a greater variety of ornamentation. As Upper Cretaceous time went on, other trends appeared.

It is convenient to discuss these changes, and others to follow, under two major headings, Upper Cretaceous Erect and Oblique Outline, and Pernoid Outline.

UPPER CRETACEOUS ERECT AND OBLIQUE OUTLINE

Non-inflated Stocks

At first there was no tendency to inflation of the snells with erect and oblique outline.

An early change in ornament, but retaining the erect outline is recorded in *I. cripplianell* from the Cenomanian Lower Chalk of England. This species has irregular, concentric ornament and Woods derives it from

EXPLANATION OF FIGURE 1

A stratigraphic and tentative genetic arrangement of some late Lower and Upper Cretaceous species of *Inoceramus* from the Canadian Western interior.

The half circles indicate that one line passes behind another.

1. To erect outline
2. Degeneration of ornament
3. To oblique-modioloid outline and degeneration of ornament
4. To bicostate ornament
5. To oblique-modioloid and modification of ornament
6. To oblique-outline
7. To alate shell
8. To oblique-mytiloid, alate shell
9. To variable inflation and partial restoration of erect outline
10. To elongation of outline
11. To degeneration of ornament
12. Through less inflated shells to partial revival of 'stem' erect outline and single, regular ornament
13. To oblique-mytiloid outline
14. To modification of bicostate ornament
15. To inflation and elaboration of ornament
16. To elongation and degeneration of ornament
17. To constricted umbones
18. To pernoid outline
19. To twisted umbo of left valve, inflation of left valve and depression of right valve
20. Inflation, alation and radial furrow
21. To pernoid outline and very fine, even concentric costation
22. Alation and inflation
23. Alation without inflation
24. To flaccid ornament
25. Inflation
26. Radial ridges
27. Elongation

I. anglicus Woods, a Lower Cretaceous 'stem' species mentioned in a foregoing paragraph. *I. crippii* in the strict sense, has not yet been recorded in Canada.

The earliest appearance of the oblique outline in the Canadian Cretaceous is in *I. dunveganensis*, with oblique-modioloid outline, from the Dunvegan formation. It represents a short-lived side branch, possibly connected with the main line of ascent through an erect species like *I. crippii*. This relation is suggested by the presence, in the Dunvegan formation, of a specimen intermediate between *I. crippii* and *I. dunveganensis*. This oblique offshoot is marked by reduced and irregular ornament and flattening or shallow furrowing of the shell just above the postumbonal slope. Yet further from *I. crippii* is a variety of *I. dunveganensis*, var. *mcconnelli* Warren, which exhibits not only further reduction of ornament, but increased convexity of the umbones and shortening of the hingeline. Not much later, and possibly partly overlapping it in age, is a second, short-lived, oblique, lateral offshoot, namely *I. athabaskensis* n. sp., with oblique-modioloid outline. The ornament is reduced as in *I. dunveganensis*, but it has a better defined, more specialized, less irregular pattern. Like *I. dunveganensis*, it may have come through an erect species, close to *I. crippii*. It occurs near the base of La Biche shale, on Athabaska river.

More important than the reduced, irregular ornament of *I. dunveganensis* or the special ornamental pattern of *I. athabaskensis* was the advent of the bicostate concentric ornament. It consists of a concentric ornament of two degrees of strength, ribs or narrow folds and fine costae. Although it underwent considerable variation, it persisted, in at least some recognizable pattern through several parallel stocks. Although this ornament is recorded by Woods in the early Upper Cretaceous *I. crippii* var. *reachensis* Etheridge from the Cenomanian Chalk Marl of Reach, England, it did not appear in any Canadian species until the time of deposition of the Lower Alberta and its correlates, the Blackstone and Kaskapau, that is not until the Turonian in European chronology, when it appeared in *I. labiatus*, a species with oblique-modioloid outline. Its origin is to be sought in an erect shell with bicostate ornament and Woods has so derived it, from *I. crippii* var. *reachensis* Etheridge.

It was at this time that the oblique-mytiloid outline first appeared, as shown in a contemporary of *I. labiatus*, viz. *I. tyrrelli* Warren, from the Kaskapau shale of Howard creek, northeast of Spirit River, Alberta. In the latter the ornament is fine and somewhat irregular. However a collection made by J. S. Stewart from Tuskoola mountain, B.C., contains specimens more or less intermediate between this species and *I. labiatus* in both outline and ornament. It is therefore possible that *I. tyrrelli* is a development from *I. crippii* var. *reachensis* parallel to *I. labiatus*, but with a change to somewhat irregular ornament and the attainment of an oblique-mytiloid rather than an oblique-modioloid outline. It may be noted that a few specimens from Tuskoola mountains are inflated, which is most unusual in this stock in the Turonian. A few specimens also record variation toward a pernoid outline, showing how plastic the variations were at this time.

Parallel with *I. labiatus* and *I. tyrrelli*, but probably of shorter range, is an independent offshoot from the erect, bicostate stock. It exhibited marked alation, rare in the erect and oblique stocks, and anticipated the similar marked alation in the later *I. cardisoides*-like species. *I. leylandensis* n. sp. from the Bighorn formation near Leyland, Alberta, has an erect shell with bicostate ornament, a well defined posterior wing and a shallow furrowing of the shell surface just above the postumbonal slope. A variety with oblique-mytiloid outline is *I. leylandensis* var. *bighornensis* n. var. from the Bighorn formation of Leyland station, Alberta.

Another parallel offshoot of the bicostate stock is *I. cf. amudariensis* Archanguelsky from the Lower Carlile of Kansas and of Turonian age in the European chronology. It retains the erect outline. *I. subquadratus* Schluter from the Austin chalk of Texas is another, but somewhat later offshoot of the erect, bicostate stock and presumably of Coniacian age in the European chronology.

Elaboration of Ornament

A side shoot from an oblique-mytiloid stock exhibits elaboration of ornament, and also well defined alation. The elaboration includes thickening of the concentric ribs into almost lip-like projections and concentric costae between the ribs. The concentric ornament declines somewhat across a depression above the postumbonal slope, but the ribs thicken into large

tubercle-like elevations along the postero-dorsal ridge below the wing. The surface of the well defined wing is almost smooth. There is also some radial costation.

These ornate, alate shells of oblique-mytiloid outline occur in the uppermost part of the Upper Alberta and Wapiabi shale of the foothills, and high in the La Biche shale on Athabaska river. Reeside has also reported shells of this kind under the name of *I. lobatus* Goldfuss from the Eagle sandstone of Wyoming. The writer has placed the Canadian shells in the species *I. lundbreckensis*. However some revision is required, giving particular consideration to their relation to the European species *I. lobatus* Goldfuss and *I. cardissoides* Goldfuss.

If the bicostate ornament and the oblique-mytiloid outline have any genetic significance, these species probably originated in a shell like *I. leylandensis* var. *bighornensis* or in an oblique-mytiloid species like, or paralleling, *I. tyrrelli*. It is a question whether all the species of this stock, with its specialized form and ornament, have the oblique-mytiloid outline. Restoration by Woods of British specimens of *I. lobatus* and *I. cardissoides* have an oblique-modioloid outline. If they are correctly restored they throw some doubt on the validity of these two outlines as criteria of two definite and distinct stocks. The original figure of *I. cardissoides* as published by Goldfuss, however, has an oblique-mytiloid outline.

This offshoot of elaborate ornament was short lived, becoming extinct at the end of *Desmoscaphtes* time.

The Shells become Inflated

Up to the end of *Prionotropis* time inflation was rare in the shells of erect and oblique outline. With the beginning of *S. ventricosus* time, however, and continuing until nearly the end of the Cretaceous it became a marked, although not an exclusive, feature of the erect and oblique stocks and of later Upper Cretaceous time. The inflation of oblique shells was accompanied by a tendency to restore the erect outline.

The 'new order' began with the advent of *I. inconstans* Woods. This is derived by Woods in his 'Evolution' from *I. labiatus*, and probably through *I. labiatus* var. *latus* Sowerby. The bicostate ornament is inherited from *I. labiatus*. In some specimens the earlier growth stages more or less resemble *I. labiatus* in outline and ornament, but with growth the shell becomes less oblique in outline, as well

as more convex. Toward maturity the ribs become larger and more widely spaced. In other specimens the earlier stages seem to have a more oblique-mytiloid or even erect outline. They too may also become inflated with growth and show the increase in size and spacing of the concentric ribs. Some varieties of this species do not become inflated, so that inflation although a typical, is, as well, a variable feature.

I. selwyni from the *S. ventricosus* zone on Smoky river is difficult to place in the evolutionary plan. It can, possibly, be interpreted as an inflated offshoot of a central erect stock, paralleling, but distinct from, the several bicostate stocks.

Late Upper Cretaceous Elongate Shells

As Cretaceous time proceeded towards its end, other changes took place. The inflated shells became elongate or oblong in outline and soon after marked degeneration of ornament set in, so that in the later Cretaceous there were inflated, elongate shells with reduced ribbing. Little trace then remained of the oblique outline, so characteristic of the mid Upper Cretaceous, on account of the tendency in oblique stocks to restore the erect outline as noted in a foregoing section, and on account of the elongation of outline. Possibly, however, the lesser height of the anterior as compared with the posterior end of some late Upper Cretaceous elongate shells is a vestige of an ancestral oblique outline.

In Canada there is little record of the stage after elongation but before decline of ornament. In the interior of the United States however *I. simpsoni* Meek may represent such a stage. In England *I. balticus* Boehm appears to represent a similar stage, and Woods has derived from it *I. inconstans* by increase in the relative length of the shell.

The stage of inflated, elongate shells with markedly reduced ornament is well represented in Canada. They appear first in the Pakowki formation and have their best development in the Bearpaw. Apparently descended from oblique-modioloid shells are *I. barabini* var. *magniumbonatus* Douglas, *I. barabini* var. *inflatiformis* Douglas, *I. palliseri* Douglas and *I. furnivali* Douglas. Descended from an oblique-mytiloid shell is *I. tenuilineatus* Meek and Hayden; it is very rare in Canada but a very fine specimen has been collected from the Riding Mountain beds near Millwood, Manitoba.

Although inflated shells of *Inoceramus* became a dominant feature of the later part of the Upper Cretaceous, all shells of the oblique and erect stocks did not become inflated. *I. inconstans*, as previously noted, appeared in moderately convex varieties, and even some of the shells in the elongate stage with reduced ornament were not inflated, for example *I. barabini*, as interpreted by Meek in 1876. As we have seen, however, this species had highly inflated varieties.

Late Cretaceous Constricted Umbones

Another tendency in later Upper Cretaceous time was toward constricted umbones. This appeared in two species from the Bearpaw of the Cypress hills, *I. mclearnii* Douglas and *I. mcshaniensis* Douglas. They appear to have come from oblique-mytiloid shells and are small, inflated, elongate species with reduced surface ornament. They have small, 'cap'-like umbones separated from the remainder of the shell by strong geniculation of the surface and by a constriction in the shell.

Late Cretaceous Revival of Regular, Single Ornament

The later Upper Cretaceous was not marked exclusively by elongate shells, inflated or compressed, nor by shells with reduced ornament. For there appeared at that time also compressed shells with more or less erect outline and single, regular, concentric ribs. They recall the outline, shell form, and ribbing of late Lower Cretaceous shells, now left far behind in the ancestry, like *I. downlingi* and *I. cadottensis*. They appear to be a revival of this early development of the stem stock.

They include species like *I. vanuxemi* Meek and Hayden, *I. proximus* Tuomey as figured by Meek and *I. nebrascensis* Owen from the United States interior, some of which are represented in Canada.

They may possibly have come from some little inflated form of *I. inconstans*, which continuing on, escaped the degeneration of ornament that overtook so many of the descendants of *I. inconstans*, and also escaped for the most part the elongation which affected so many late Cretaceous shells. They lost the fine, concentric costae, retaining only the ribs of the ancestral *I. inconstans* and *I. labiatus*. There is another possibility, namely, that they came directly from some persistent central, erect stock, independent of the bicostate stock.

THE PERNOID OUTLINE

Beginnings

It is not likely that we have yet a complete record of the radicals of the pernoid stocks in the earliest Upper Cretaceous beds in Canada, for example, in the Dunvegan formation. However it is known that species with the pernoid outline did appear at the beginning of the Upper Cretaceous. Thus Woods records *I. pictus* Sowerby from the Lower Chalk of England. It has the pernoid outline and represents an early stage before inflation or alation set in. It has a characteristic closely set, fine costation which aids in the detection of its descendants and also seems to indicate that some pernoid stocks are not descended from it.

In one line of development the shells become alate, without becoming inflated. *I. allani* Warren from the Kaskapaw shale of Howard creek in the Peace River district of Alberta appears to be descended from *I. pictus* Sowerby or from a similar species. It retains the pernoid outline and to a considerable extent the fine, even and closely spaced, costate ornament of that species. It, however, has developed some concentric folds and some approximation to the demarcation of a posterior wing. It thus resembles some of the British shells included in *I. lamarki* var. *cuvieri* Sowerby. A shell in the Bighorn sandstone resembles *I. lamarki* var. *latus* Mantell, and is also descended from *I. pictus*.

In the United States interior *I. flaccidus* White is from the Apishapa shale member of the Niobrara formation of Colorado and is at a somewhat higher horizon than *I. allani*. It retains the pernoid outline and comparatively low convexity of *I. allani*, but has also a well demarcated posterior wing, a radial furrow and a style of concentric ornament aptly described as flaccid by White. It is difficult to say whether this species has come through *I. allani* or some variety of *I. lamarki* and hence from *I. pictus* or from some Cenomanian species with the pernoid outline, but lacking the typical surface costae of *I. pictus*.

Inflated Stocks

Inflated shells appeared at least as early as the time of the *Watinoceras* and *Prionotropis* faunas in the Lower Alberta, Blackstone and Kaskapaw formations of Alberta, that is of the time of the Turonian in European

chronology. *I. capulus* Shumard and *I. capulus* var. *corpulentus* are evidently descended from a species with the outline and surface ornament of *I. pictus*. They have added inflation of the shell and variable concentric folds or ridges which with the fine, concentric costae result in a bicostate ornament. *I. capulus sensu strictu* has added the beginning of a posterior wing and belongs to a stock which in the British and other sections gave rise to *I. lamarecki* with its well defined posterior wing and concentric, somewhat angular ridges as well as fine concentric costae. *I. capulus* var. *corpulentus* gives rise to several species which will be described below.

A stock, which is probably distinct from the *pictus-capulus* stock, but paralleling it closely in development,, is that which ends in *I. fragilis* var. *priariensis* n. var. which is said to come from the Bighorn formation of Prairie Creek, Alberta. It is very close to *I. fragilis* var. *howelli* White from the Carlile formation of Utah and is probably of the same stock. *I. fragilis* var. *priariensis* has a well defined posterior wing, a shallow furrow or flattening on the post-umbonal slope and concentric costation not so regular as in *I. capulus* and not of the *pictus* style. As the very closely related *I. fragilis* var. *howelli* is said to show variations toward shells like *I. fragilis* and *I. perplexus* it is possible that var. *priariensis* had an origin like var. *howelli* in a pernoid shell distinct in surface ornament from *I. pictus*.

Radial Ridges and Furrows

I. capulus var. *corpulentus*, like *I. capulus*, is a very variable form, particularly in concentric ornament. Some specimens have only the closely set, even costate, *pictus*-like ornament, while others have in addition concentric undulations and even, fairly angular ridges. Somewhat irregular, radial furrows appear in some specimens. These foreshadow a shell in the succeeding faunal zone, *I. pontoni* var. *dolosoniensis* which is larger than *I. capulus* var. *corpulentus* and has taken on a somewhat abruptly rounded postumbonal slope, a shallow furrow just above it and a characteristic course of the ridges and furrows. A further change, lengthening of the shell, gives typical *I. pontoni* an elongate species with concentric ridges and costae and typically an abruptly rounded post umbonal slope and shallow sulcus above it. The development from an *I. pictus* or *pictus*-like

shell to *I. pontoni* is parallel in part at least with that from *I. pictus* to *I. cordiformis* in the English Cretaceous. Both *I. pontoni* and its variety *dolosoniensis* n. var. occur in the *Scaphites ventricosus* fauna and are common in the Badheart sandstone on Smoky River. Another parallel development from *I. pictus* is that ending in *I. coulthardi* with its angular post-umbonal slope and well demarcated anterior area. This species occurs in the *S. ventricosus* fauna on Smoky River and in the Blairmore area, Alberta.

It may be noted that Warren has described a species, *I. rutherfordi*, said to come from talus of the Dunvegan formation on Smoky River. It shows some resemblance to both *I. pontoni* and *I. cordiformis*. It seems out of place, so early in the Upper Cretaceous. It may, however have come from the glacial drift and originally from the Badheart formation or adjacent horizon.

The *Exogyra* Habit

In one stock there is twisting of the umbones and the left valve becomes much deeper than the right. This is the genus *Volviceras* Stoliczka and the involute group of Heine. In Canada it is common in the *Scaphites ventricosus* fauna. As Woods has indicated the trend is in the twisting of the umbones, increase in convexity of the left valve, flattening of the right valve, degeneration of ornament on the left valve and the development of strong, concentric ribs on the right valve.

In the Cretaceous of the Canadian interior *I. exogyroides* Meek and Hayden and *I. umbonatus* Meek and Hayden represent two stages in this trend. There appear to be also even more primitive stages represented by some undescribed species or varieties. All however are coeval in age and in *S. ventricosus* fauna. This trend seems to be paralleled in Europe by *I. koeneni* Muller and *I. involutus* Sowerby. Heine includes *I. undabundus* Meek in his involute group. It occurs in the upper part of the Colorado shale in the United States western interior. *I. cf. undabundus* occurs on Drywood river, Alberta, probably in the *S. ventricosus* zone of the Alberta shale.

Although this stock may have originated in some form of *I. capulus* var. *corpulentus*, it also may have had an origin in some pernoid shell independent of *I. capulus* var. *corpulentus* and even of *I. pictus*.

SUMMARY

The shells of the Lower Cretaceous stem were of erect to somewhat pernoid outline and were characteristically ornamented with even, regularly spaced, concentric ribs, although there was some degeneration of surface ornament in an offshoot from the main stock. At the beginning of the Upper Cretaceous, the main trends were to increased radiation and branching, variety of outline and increased complexity, and variety of surface ornament.

In one branch of numerous forking stocks corresponding to the *labiatus* branch of Woods, the shells were of erect and oblique outline, the oblique-modioloid outline appearing before the oblique-mytiloid. In succession the main trends were towards bicostate ornament, oblique outline, inflation, partial restoration of erect outline, elongation, marked degeneration of ornament, and, in one stock, to constriction of umbones. In one offshoot there was elaboration of ornament and alation. One stock escaped inflation and mostly elongation, lost the fine costation of the bicostate ornament and partly revived the ornament and outline of the primitive, Lower Cretaceous stem. An alternative hypothesis has been proposed however for the origin of this 'revival' stock.

The pernoid branch corresponds to what may be called the *pictus* branch in Woods' 'Evolution' of the British species. It consisted of several, apparently distinct stocks. It became extinct at a much earlier age than the oblique and erect, or *labiatus*, branch. It developed inflated shells at a much earlier age. Elongation of the shell was very rare and so also was the degeneration of ornament, in marked contrast to the *labiatus* branch. On the other hand this branch showed a greater tendency to develop well defined posterior wings. It included shells with radial ridges and furrows. It also produced shells with twisted umbones and very unequal valves, quite unknown in the oblique. The acquirement of bicostate ornament seems to have had a different history from that in the *labiatus*

or in the oblique and erect branch; in the pernoid stocks the concentric fine costae appeared before the concentric ribs or folds while in the oblique-erect or *labiatus*, branch they were acquired after the concentric ridges or folds.

In conclusion it may be said that the evolutionary pattern of the Canadian species is much like that of the British species. The trends are much the same. However the degeneration of ornament, the late revival of the early, simple, regular ribbing and the constriction of the umbones in the late Cretaceous seem to be trends not shared with the British species.

It is repeated that this attempt to determine the trends in the evolution of Canadian species and to determine the pattern of that evolution is tentative and exploratory. Much information has yet to be gathered and some at least of the generalization herein offered may require revision. It is hoped, however, that this analytical discussion will stimulate interest in the study of this interesting and, to the stratigrapher, very important genus.

OTHER STOCKS OF INOCERAMUS

The *concentricus-sulcatus* series has not been recognized in the Cretaceous of the Canadian interior. It is of course present on the Coast in the late Lower Cretaceous Haida formation at Skidegate inlet, Queen Charlotte islands.

A group of shells only tentatively referred to *Inoceramus* include *I. ? nahwisi*, *I. ? nahwisi* var. *goodrichensis* n. var. and *I. ? nahwisi* var. *moberliensis* n. var. They have nearly central and opisthogyrous beaks and the antero- and postero-dorsal angles are flattened into 'wings'. The species occurs in the *Neogastrophites* fauna in the Upper part of the Fort St. John formation on Peace River. The two varieties occur in an unnamed formation of probably pre-Dunvegan age in the Pine River valley and the valley of Coal creek.

SYSTEMATIC PALAEONTOLOGY

All types are in collections of the Geological Survey of Canada

Inoceramus cadottensis var. *altifluminis* n. var.

Compared with the species the shells of this variety are relatively shorter in outline, have more convex umbones, have an anterior area below and in front of the umbo where the

shell surface descends abruptly to the anterior margin, have a better defined 'wing' and more reduced surface ornament. Regular, concentric, evenly spaced ribbing is confined to the umbones and adjacent surface. The re-

mainder is covered with irregular, unevenly spaced, broad folds.

Approximate measurements of the paratype, cat. no. 8936, are: height 165 mm.; length, 150 mm.

altus, deep; *flumen*, a river or creek.

Types. The holotype, cat. no. 8935, is from talus of the *Gastrophites* zone in the lower part of the Fort St. John formation at the mouth of Deep Creek, Peace River canyon, B.C. The paratype, cat. no. 8936 is from the same talus.

Inoceramus athabaskensis n. sp.

This large, compressed species of slightly oblique outline, is much higher than long, has low umbones near the anterior end of the fairly long hingeline, has a long and convex anterior margin, a short and rounded basal margin and a posterior margin convex below and nearly straight and oblique above. The mostly low, concentric ribs are strongly curved where they cross the central part of the shell. They are prominent on the anterior, much reduced on the central, and of medium prominence on the posterior part of the shell. There is degeneration of ornament at maturity.

Approximate measurements of the paratype, cat. no. 8938: height, 23 mm.; length, 17 mm.

Compared with typical *I. dunveganensis*, this species is much larger, is more compressed on the umbones, has a shorter if any anterior area and has stronger ornament with a definite pattern of stronger ribs anteriorly and posteriorly and reduced on the middle of the shell. Compared with *I. crispis*, it is much larger, more oblique in outline, probably more compressed and has more regular ornament with a definite pattern of strong and reduced parts on each valve.

Athabaska, a geographic name.

Types. The holotype, cat. no. 8937, is from the basal part of the LaBiche shale on Athabaska river, about 2½ miles below Stony Rapids. The paratype, cat. no. 8938, is from a similar horizon on west bank of Athabaska river, just above Stony Rapids.

Inoceramus leylandensis n. sp.

This is a moderately convex, somewhat orbicular species with subterminal beaks, well defined posterior wing and a radial flattened or slightly furrowed band just above the post-umbonal slope. The surface is ornamented

with relatively coarse, concentric, somewhat angular folds, which, where they cross the radial flattened band are of less relief and almost straight. There are also fine, concentric costae.

Measurements of the holotype are: height, 43 mm.; length, 38 mm.

This species differs from *I. labiatus* Schlotheim in the erect, not oblique, outline, better defined posterior wing, flattened or furrowed band above the postumbonal slope and on the average, the stronger, but modified ornament.

Leyland, a geographic name.

Type. The holotype, cat. no. 8939, is from the Bighorn sandstone one and one half miles southeast of Leyland Station, Alberta.

Inoceramus leylandensis var. *bighornensis*

n. var.

This variety differs from the species in the higher than long and oblique outline, the terminal beaks, fairly long, anterior area, and concave anterior margin below the umbones. Like the species it has the well defined posterior wing, the radial flat band or furrow above the post-umbonal slope and the same surface ornament.

Measurements of the holotype are: height, 54 mm.; length, 52 mm.

Compared with *I. labiatus* Schlotheim this variety has an oblique-mytiloid, not oblique-modioloid outline with terminal beaks, longer and more concave anterior area, better defined wing, somewhat coarser and more modified ornament and the radial flattened or furrowed band. It differs from *I. tyrrelli* Warren in the better defined posterior wing, the coarser and more modified ribbing and the radial flattened band.

Bighorn, a geographic name.

Type. The holotype, cat. no. 8940, is from the same horizon and locality as the holotype of the species.

Inoceramus fragilis var. *prairiensis* n. var.

The holotype is much higher than long and of 'erect', not inclined outline. The anterior border is long and nearly straight, the basal short and rounded, a postero-ventral margin is oblique, short and nearly straight, the posterior border is broadly rounded and a little oblique and the hingeline is short. The beaks are incurved, curved forward a little and anterior in position. The shell is much inflated and there is a

long, deep, somewhat concave, anterior area. Posteriorly the surface descends abruptly to a fairly well defined posterior ear. There is a flat band or very shallow depression just above the post-umbonal slope, which continues to the postero-ventral margin. The surface is ornamented with some faint, concentric folds and numerous, approximate, concentric fine costae. Some other specimens, otherwise close to the holotype, have a deeper and more narrow radial furrow above the post-umbonal slope.

Measurements of the holotype are: height 55 mm.; length, 35 mm.

If, among the cotypes of *I. howelli* White the specimen illustrated as figure 1a on plate 4 (White, 1879) and figure 3 on plate 11 (Stanton, 1893) be selected as the lectotype, then typical var. *prairiensis* differs from typical var. *howelli* in having a relatively higher and shorter outline, in having possibly, a longer posterior wing, in lacking the long basal margin of *howelli* on which the radial furrow produces an emargination and in having instead a shorter basal margin and in addition an oblique postero-ventral margin. It is closer to the specimen illustrated as figure 1c on plate 4 (White 1879). A few specimens are closer to *howelli*, resemble the specimens illustrated as figure 5, plate 11 (Stanton, 1893) and can best be labelled var. *howelli* White.

Prairie, a geographic name.

Types. The holotype, cat. no. 8941, is said to be from the Bighorn sandstone of the west branch of Prairie creek, Alberta.

Inoceramus pontoni var. *dolosoniensis* n. var.

This variety differs from the species in the much higher outline, that is, it is higher than long, not longer than high. While ordinarily this might not seem good grounds for erecting a new variety, it happens that in this species the high form seems to form an important link in the evolution of the stock to which it belongs.

It shares most of the characteristics of the species, the anterior position and the anterior curvature of the umbones, the inflated form, the deep, flat to somewhat concave, anterior area, the abruptly rounded post-umbonal slope, the very shallow sulcus, or flattening, above it, the concentric, rather angular ridges, nearly straight on the side, abruptly bent over the rounded umbonal slope, nearly straight across the furrow and bent upward

to the dorsal margin, and the concentric, fine costae.

Measurements of the holotype are: height, 90 mm.; length, 75 mm.

Dolosonia, a latin name for Bad Heart. *Type*. The holotype, cat. no. 8942, is probably from the Bad Heart sandstone below the mouth of Puskwaskau river, on Smoky river, Alberta.

Inoceramus nahwisi var. *goodrichensis* n. var.

The holotype is rather small, higher than long, of somewhat oblique outline and moderately compressed. The hingeline is short, the anterior margin is convex below, nearly straight and oblique above, the basal margin is rounded and the posterior margin is generally convex below and nearly straight and oblique above. The umbones are wide, and rather flat, with abruptly descending slopes to both anterior and posterior wings, the anterior slope being the steeper. The beaks are nearly central on the hingeline and turned a little backwards. The surface of the holotype is nearly smooth down the centre of the shell, but on either side there are concentric, fairly strong ribs descending obliquely down the sides and which turning abruptly continue toward the nearly smooth centre of the shell.

The paratype, cat. no. 8944, is smaller than the holotype and much more oblique in outline. The ribs are better preserved. They extend down the sides and turning abruptly, extend across the shell in a very gently curved line to a central, narrow, smooth area.

Larger specimens show the ribs crossing the back of the shell without interruption. Some shells become longer with growth, so that the maximum length is near the ventral margin. A few very large specimens have the concentric ribs of subquadrate outline and extending across the back of the shell. They may be of this species, but the hingeline, beaks and umbones are not preserved.

Measurements of the holotype are: height, 44 mm.; length, 34 mm.

Compared with *I. nahwisi* McLearn from the *Neogastropilites* fauna of the upper part of the Fort St. John formation, the outline is more oblique and in the larger shells the ribs extend across the back of the shell without interruption.

The exact generic relations of this species are not known. It has not been possible to prepare the hinge. It has something the appearance of a *Posidonomya*.

Goodrich, a geographic name.

Types. The holotype, cat. no. 8943, is from an unnamed formation, probably earlier than Dunvegan, on Hulcross creek, Pine River valley, B. C.. The paratype, cat. no. 8944, is from the same formation, on Pine River, B.C.

Inoceramus nahwisi var. *moberliensis* n. var.

The holotype is of moderate size, higher than long, very oblique in outline and fairly compressed, except on the umbones which are quite inflated. Antero- and postero- dorsal angles flattened into wing-like depressed areas. The beaks are about on the middle of the hingeline and turned backward a little, i.e.

they are somewhat opisthogyrus. The surface is ornamented with rather evenly spaced, well rounded, concentric ribs, which are continuous across the back of the shell. It differs from var. *goodrichensis* in the strong ventral curvature of the ribs and the inflated umbones. In the typical forms the ribs seem to be continuous at all stages of growth across the shell.

Measurements of the holotype are: height 47 mm.; length 40 mm.

Moberly, a geographic name.

Type. The holotype, cat. no. 8945, is from an unnamed and probably pre-Dunvegan formation on Coal creek, a tributary of Johnson creek, south of Peace River canyon, B.C.

NOTES AND OBSERVATIONS

CANADA GEESE SUMMERING IN NORTHERN ONTARIO.—On June 25, 1942, during the course of a patrol by sea plane, a stop was made at Smoky Falls, Ontario, on the Mattagami River, 55 miles north of Kapuskasing.

The Ranger here related during the course of a conversation on the fauna to be found around this area, that his father-in-law, an Indian, had discovered the presence of Geese (probably Canada Geese, *Branta canadensis*) nesting grounds not far away to the north in McCausland Township.

We were immediately interested and so, a little later, with the ranger, we took off to see if we could locate the geese.

By the time we were in McCausland Township, the country had changed from the poplar and jackpine regeneration on the slopes around the Mattagami River to a vast flat area of muskeg, exactly similar to the country around James Bay. (At this point, we were about 100 miles from the Bay.) Throughout this area, except for a belt of fair-sized spruce along the rivers and larger streams and the bigger lakes, there was no tree growth except dwarf widely-spaced tamaracks and the odd bunch of black spruce trees. The remainder of the area was a greyish yellowish green blanket of moss interspersed in large patches by ripple-like depressions filled with water, giving a striking similarity to waves of moss and water. Trails of caribou wended

about throughout the area.

Flying very low over the moss and water-filled depressions, four geese were sighted beside one of the water holes on the moss. They were of the exact colour of the muskeg. All four flew off upon our roaring arrival. No more were located in this type of habitat. Finally, after traversing a large area at a height of 500 feet, we came upon a chain of five quite large lakes which are not shown on the map, but apparently are expansions of some creek flowing perhaps into the Opazatika River. In one of these, two flocks of geese were discovered swimming on the water. There were probably 30 geese altogether. Young appeared to be present. A pair swam off at one side by themselves.

Landing on the largest lake, we taxied up to the beach. Upon wading ashore, the tracks of more geese were found, although no geese were noted in this lake.

These lakes are roundish in shape with a mucky, yet solid bottom, and shallow. The shores, to about 100 feet from the water are ringed by black spruce trees about 30 feet high which shade off a short distance from the lake into the muskeg. The immediate shore was covered by alder and willow and in the far distance the larger spruce trees along the Missinaibi River stood out sharply above the scrub larch and muskeg.—QUIMBY HESS, Kapuskasing, Ontario.

CHARLES SCHUCHERT — 1858 - 1942¹

By T. H. CLARK
Redpath Museum, McGill University, Montreal

IN THE PASSING of Charles Schuchert Geology has lost one of its most remarkable members. He was equally well noted as an investigator, a teacher, and a writer. Although his work lay in paleontological and stratigraphic subjects, there are few modern workers in any of the diverse geological fields who have not felt his influence.

It is an axiom in modern life that to achieve eminence in any of the scientific disciplines one must begin in college and follow through by post-graduate study. Schuchert's first connection with teaching in a University was when he entered Yale as a professor, an occasion which, it has been said, reflected as much credit upon Yale as it conferred honor upon Schuchert. His career began as an old-time naturalist collecting fossils; it did not end until his profession had conferred upon him all possible honors.

Charles Schuchert was born in 1858. It was expected that he would enter his father's furniture factory, but the fossils he loved to collect were too plentiful in the fields and quarries of his native Cincinnati to allow him any spare time for commerce. He has recorded that "my father often told me that if I paid as much attention to the furniture business as I did to the collecting of fossils, I would some day be a rich man." To his delight he found it was possible to earn a living working with fossils and after one or two preliminary ventures he formed, in 1885, an association with E. O. Ulrich, assisting the latter in collecting and preparing fossils and in making lithographed plates of fossils for publication, and to use his own words "my divorce from the furniture business was complete". Among other tasks undertaken by these partners was the making of thousands of thin sections of the local fossil bryozoa. Practically all the grinding of the specimens was done upon an old discarded window-sill of fine sandstone, an improvisation which serves as an object lesson to those today who consider that progress can only be made by means of mechanical refinements.

His success in this kind of work was not long unnoticed. In 1889 James Hall, Director of the Geological Survey of New York and the lifelong Titan of American paleontology, "stopped in Cincinnati to see a young enthusiast by the name of Charles Schuchert", who "had brought together an extensive and carefully identified collection, undoubtedly the best to be found in that region." (Clarke, J. M., *Life of James Hall*). Schuchert became Hall's assistant at once, and in that capacity the unrivalled collections of the New York State Survey offered him opportunity for study limited only by the amount of work which he could crowd into each twenty-four hours. Under the aegis of such a master Schuchert's reputation grew apace, so that when that association was dissolved other and more important opportunities crowded upon him. He spent a year as laboratory assistant to Professor Beecher at Yale, then one of the leading students of brachiopods. It was not long before the student outstripped the master, for Schuchert became, early in his career the foremost authority in North America on brachiopods, a distinction which he held for the rest of his life. He next joined the United States Geological Survey, transferring after a year or two to the United States National Museum, where he remained until 1905. The opportunities for research at the latter institution enabled him to develop his talents to the full, and a long series of scientific papers began to issue from his pen, not only on brachiopods, but on other groups of fossils also, and on stratigraphic subjects. His reputation as a productive scientist was firmly established. In 1905 Yale University offered him a professorship (left vacant upon Beecher's death), a post to which he brought a balanced enthusiasm for all kinds of 'soft-rock' geology. His connection with Yale after his retirement from active teaching was maintained as Professor Emeritus up to the time of his death.

His bibliography is a long one, and his interests within his chosen field were many. He is best known, perhaps, for his work upon Paleogeography. He produced no fewer than 125 maps of North America showing the distribution of land and sea at as many

1. — Received for publication, Jan. 13, 1943.

times in the past. His discussion, with Ulrich, of "Paleozoic Seas and Barriers" opened up new avenues of thought in regional sedimentation, a field which had at that time not felt the quickening impact of petroleum research. Although no sedimentary rocks escaped his attention, he paid especial heed to, and is well known for his work upon, Paleozoic rocks and events. Atlantis and Gondwanaland, Paleozoic tectonics, brachiopod classification, Paleozoic Stellerioidea, and climates of the past are but a few of the many miscellaneous topics illuminated by his writings. His most ambitious project was a complete treatise upon the Historical Geology of North America. Three volumes were planned for. The first of these, on the Antillean-Caribbean region, was published in 1935. The second, on Eastern and Central United States, appeared immediately after Schuchert's death in December. It is hoped that the third is sufficiently far advanced to allow posthumous publication.

His textbooks on Historical Geology have earned him wide recognition. Beginning in 1915, as part of the original "Pirsson & Schuchert", his text has gone through a dozen revisions and editions until at present it forms part of the most widely used textbook of Geology on this continent. Only a man with a wide knowledge of his field and a wise understanding of what should properly be presented to elementary students could have achieved such great and lasting success.

Honors came to him in abundance late in life. Both Yale University and New York University conferred upon him honorary doctorates. He was elected a member of many

prominent foreign geological societies. He has been President of both the Paleontological and the Geological Societies of America. The recognition of his talents was climaxed in 1934 when the latter society selected him, after a careful canvass of the prominent geologists of the world, to be the recipient of its highest honor, the Penrose Medal.

His kindly disposition was reflected in his willingness to give his time and advice unstintingly to all who asked for them. Scores of students have been helped over financial hurdles by the wise and unobtrusive opening of his purse. It has been said that though Geology was his business, helping young geologists was his hobby.

He was always of a serious turn of mind, rarely inclined to levity. With him a discussion never reached the stage of an argument, for he was not interested in a point of view for its own sake, but only as it fairly represented a situation. No matter what his own preconception might have been he was tolerant of the point of view of others and was always ready to accept a new opinion or a new fact. Once convinced of his course, however, it was hard to shake him. The writer well remembers him, a man approaching eighty years of age, looking and listening all day at Philipsburg, Quebec, turning page after page in his little pocket notebook with observations some of which, it is pleasant to think, doubtless helped him in his latest revision of his textbook, and through that text may influence the training of hundreds of the geologists of tomorrow.

NOTES AND OBSERVATIONS

NESTING OF THE TURKEY VULTURE NEAR MEAFORD, ONTARIO.—A nest of the Turkey Vulture (*Cathartes aura septentrionalis*), containing two eggs, was discovered on June 10, 1942, near Meaford, Ontario, by Ted Moore, while he was rambling through the woods along the neighbouring part of the Niagara escarpment. One of the eggs hatched on June 12, 1942, and when the nest was visited two days later both had hatched.

The nest was situated on a ledge in a crevice in the escarpment, which at that point is

about two hundred feet high. There was no nest construction except a slight hollow in the vegetation that covered the ledge. Protection from rain was afforded by overhanging rock.

Two halves of the shell of one of the eggs were sent to the Royal Ontario Museum, Toronto.

Turkey Vultures appear regularly in mid-April in this area, bordering the south end of Georgian Bay, and are seen here daily throughout the summer. — L. H. BEAMER, Meaford, Ontario.

A HUGE MIGRATION OF HAWKS IN ONTARIO ¹

By W. E. SAUNDERS,

London, Ontario

ON THE NORTH SHORE of Lake Erie, approximately half-way between the two ends, runs a high cliff of clay, for perhaps a hundred miles. Near London, which is thirty miles north of the lake, the contour of the shore seems to lend itself to the desires of diurnal migrants, the most prominent of which are the hawks, and thither Londoners repair every autumn in the hope of seeing a flight of these interesting birds.

To know when the hawks would arrive one should make close study of the weather in the north country but this is not often feasible, and so, we just guess when will be the proper time to make the journey to look for the flight.

In September, 1942, I witnessed a spectacular and unprecedented migration of hawks. Two years earlier, on September 22nd, 1940, three of us witnessed a considerable flight, but our reward was modified by the fact that the Broad-winged Hawks (*Buteo platypterus*), which constituted the largest number of the hawks seen, were so high that counting was utterly impossible, and it was difficult to make even a rough estimate. I put down 700 as a conservative guess, though one of the party exclaimed, "There must be a thousand up there right now." Judging by subsequent events, he may easily have been right, for as we watched, flashes of sunlight would be reflected from birds so high that our glimpse of them was only momentary.

In early September of 1942 I had not noticed in the reports that there were any rains in the north on September 4th and 5th, but on the 6th my friends, Fred Bodsworth and Will Morris, Jr., witnessed a flight of Broad-wings which they estimated at 1,500 while watching at Port Burwell, 20 miles east. When this was reported, I wondered whether this might not comprise nearly all our Broad-wings, because when one goes north he rarely sees more than a single pair or two in a week. Then, on the 13th, Mr. Bodsworth witnessed another hawk migration at Port Stanley, in which the most numerous birds were Sparrow Hawks, making it appear that the Broad-wings were perhaps through. So our experience on the 20th was the more surprising.

We arrived at what we call the Hawk Cliff at 9.20 in the morning and found Fred already there, reporting --well he might have reported but he didn't have time, for, immediately on our arrival, hawks were in sight -- and there was no time to do anything but get out notebook and pencil and begin the work of the morning.

First came small numbers of Sharp-shinned Hawks (*Accipiter velox*), the most reliable of all the species, and the record begins with one. Sparrow Hawks (*Falco sparverius*) were next, beginning with three and soon Broadwings came, beginning with 15; and that page in the notebook recorded nine and six, because in writing 15 thus, one may write figures without separating marks, as he must do if he writes "15". That line records the following row of digits: 96999984299 but the birds came too fast to record in such small groups and the next line reads 45-25-8-23-45-4-80-148-3-1. When one thinks of two people counting and estimating all these and eight other species of birds in about half an hour he can readily see that we had a busy time.

On the next page of my notebook there was a lull in the records of Broadwings, and we recorded only 1, 13 and 94, totalling 108, with six other species on the same page; but on the next page the Broadwings really came along and the totals were estimated --never counted because counting was impossible. There were six lines of figures of Broadwings on that page, the first one reading 62, 40, 30, 43, 90, 102, with larger figures on the following lines, the total for the page being 2,624. To sum up this extraordinary and remarkable flight of this hawk, far outnumbering all other species put together, one can only say that from 9 a.m. till 4 p.m. they flew intermittently in vast numbers, the total count being 4,949, just under 5,000. What an amazing total for this rather rare hawk. And the best part of it is that this species has no black mark on its menu, which consists partly of mammals, but mainly of snakes, frogs, insects and anything else that moves and is catchable. It is a slow hawk, as the nature of its food hints.

While the total seen on this day is impressive, one may easily spend a day in the north

1 -- Received for publication, December 17, 1942.

country without seeing it, though in a week one is almost sure to see a number of them. They are very easily identified by a wide white bar across the dark tail near the end, but the really easy way to tell them in migration is by the habit of migrating in flocks, which no other hawk does in Ontario. The flocks are not close, but often they gather in the upper air to float around in astonishing circles, and thus one may see twenty-five, fifty or even a hundred in a single group, and he may have many more in the field of his glass than he can possibly count. Such an amazing number seen in one day, remembering the scarcity of the bird on its breeding ground, impresses strongly on the mind, the vastness of the northern territory it calls "Home"—literally thousands of square miles.

On that memorable day we saw all of the possible hawks except the Red-shouldered and the Red-tailed (*Buteo lineatus* and *Buteo borealis*), including even the rare Duck Hawk (*Falco peregrinus*) (the species that nested or tried to nest on the Sun Life Building in Montreal), of which two were seen; the Osprey, (*Pandion haliaetus*) again two; Bald Eagle (*Haliaeetus leucocephalus*), four; Marsh Hawk (*Circus hudsonius*) 18; Cooper's Hawk (*Accipiter cooperi*) 22; Pigeon Hawk (*Falco columbarius*) 27; Sparrow Hawk 148; Sharpshin 168 and Broadwing 4,949, making a grand total of 5,340. Of all these birds, none came in flocks except the Broadwing; one might see

a casual two, chasing each other in the air, but there was never any approach to what one might call a flock.

Often the observers were puzzled; as for instance by the Marsh Hawks of which there were two hunting over the field to the east of us, but we counted them once and refused to add to their number unless one flew past going west, and during the whole count, less than a dozen were travelling east. True, the Broadwings seemed to persist in all going in one direction at a time, but that direction changed from time to time and we judged that they were floating against a breeze; and no one ever saw anything done more easily than their floating; it was literally, floating. With wings set, they sailed through the air with no hesitation and with no effort.

In the morning the sky was clouded and colours counted for little, but the sun came out in the afternoon and identification by colour was much easier. Then we were able to distinguish much more easily between the Pigeon Hawks and the Sparrow Hawks. One may imagine (I do it myself) that he can tell these two apart by their flight, but, many times the species is in doubt.

On that day the number of Pigeon Hawks seen was almost unprecedented, totalling 27, besides those that we could not be sure of and which were listed as the more common Sparrow Hawk.

NOTES AND OBSERVATIONS

SASKATCHEWAN WILD LIFE.—The first two numbers of a new mimeographed publication "The Blue Jay," Official Bulletin of the Yorkton Natural History Society, has just come to hand. The objects, as set forth on the cover are,—"To foster an active interest in every branch of natural history, and to promote the conservation of all wild life; also to act as a connecting link between nature lovers in Saskatchewan". It is to be published quarterly, the secretary's address is Box 642, Yorkton, Saskatchewan, and the membership fee .25c per year.

No. 1, (Oct.-Nov.-Dec., 1942, pp. 1-7) contains an editorial on the season, local notes such as a bear seen locally, an albino black-bird, a godwit attacking a passing crow and

killing it, Ducks Unlimited wild fowl program, Indian relics, formation of junior Audubon clubs and additions and corrections to the local list of birds that was distributed in mimeographed form last year.

No. 2 (Jan.-Feb.-Mar., 1943, pp. 8-15) has an editorial, local notes, and requests for further information on wild life, an article on wild bird pets, the results of the Christmas bird censuses, and an item on the status of the sharp-tailed grouse, which is apparently common in some areas, scarce in others.

The Yorkton Natural History Society was formed last September, and now numbers about 124 members. Mrs. I. M. Priestly is president, and C. Stuart Houston is secretary-treasurer. We wish the Society every success in this new venture. A. L. RAND.

SUSPECTED BOTULISM IN WILD DUCKS IN ONTARIO ¹

By A. MURRAY FALLIS,
Ontario Research Foundation, Toronto

THIS REPORT OF SICKNESS among wild ducks on marsh lands in Dover Township, Kent County, Ontario, in the autumn of 1941 was made possible through the co-operation of a number of individuals.

Sick as well as dead ducks were observed by Messrs. William and Metro Sass. The latter suspected the birds were suffering from botulism and therefore sent a Teal and later a Shoveller (*Spatula clypeata*) to Prof. J. R. Dymond, Director of the Royal Ontario Museum of Zoology, who sent the birds to the Ontario Research Foundation for post-mortem examination. A Mallard duck (*Anas platyrhynchos*) was collected by Mr. William Keller game overseer of the district, who submitted it to Mr. H. H. MacKay, Provincial Biologist. This bird was also sent to us for examination.

An account of the outbreak has been given by Mr. Keller (personal communication), who found dead ducks on one side of an artificial marsh which was about 600 acres in area. It had been created by placing a dyke around an area of pasture marsh and then pumping water on to it. The water on the marsh was shallow, hot and stagnant at the time of the outbreak. Many of the dead ducks showed evidence of bleeding at the nose and sick birds were partially paralysed. Mr. William Sass began pumping water onto the marsh as soon as dying ducks were found after which mortality among the ducks was not observed.

These conditions are similar to those which Kalmbach (1934) described as being associated with botulism in ducks. He pointed out that botulism being an intoxication rather than an infectious disease is contracted by the ingestion of toxin produced by the growth of *Clostridium botulinum* type C in suitable media. Dead organic matter, such as that found in any marsh, mud flat or area of overflowed land, provides suitable material for the growth of the organism. The disease has also been found to be closely related with areas of shallow, stagnant water, and outbreaks have terminated following the raising of the water level. Epizootics seldom occur where the water is kept more than a foot or more in depth.

Other important factors associated with the disease are the degree of alkalinity and salinity, the temperature and the abundance of birds in the area.

Post-mortem examination of the three ducks sent to us revealed few striking lesions common to all. The intestines of the Teal and Mallard were practically empty and the walls contracted. The feathers around the vents were soiled with a greenish excrement. The blood vessels of the small intestines were congested and there was some inflammation in the intestinal walls. None of these symptoms were as marked in the Shoveller. It may be significant that this bird, although partially paralysed, was still alive when collected. The heart was in systole in all birds. There were haemorrhages in the meninges of the upper part of the spinal cord of the Mallard (the heads of the others had been removed before they were received). These symptoms are, according to Dr. Kalmbach (1934), suggestive of botulism.

Bacteria-free aqueous extracts were made from the livers of each of the birds. A small intraperitoneal injection of that from the Teal was lethal to guinea pigs, but not that from the Mallard or Shoveller. However, anaerobic incubation at 37°C of a portion of the liver from the Shoveller in a glucose-meat-infusion broth for 17 days produced a toxin which was very lethal to guinea pigs.

Dr. H. Sommer of the Hooper Foundation, California, kindly supplied some *Clostridium botulinum*, type C antitoxin against which we were able to test the two samples of toxin. The details of these experiments will be omitted. It was found however that guinea pigs survived lethal doses of the toxins if sufficient amounts of *Cl. botulinum* type C antitoxin were mixed with the toxins beforehand. Moreover injections of sufficient amounts of antitoxin into guinea pigs protected them against injections of lethal doses of toxin two hours later.

It appears probable on the basis of the above evidence that this sickness in ducks was due to botulism. However Drs. Kalmbach and Quortrup in personal communications point out that the presence of *Cl. botulinum* type C

in the livers of ducks, although highly indicative of botulism, cannot be considered a positive diagnosis as the organism may be present in normal livers. Dr. Quortrup has demonstrated the toxin in the blood of infected birds, up to 68 hours after its ingestion, by intraperitoneal injections of the serum into mice, and by identifying it by the use of antitoxin.

It is a pleasure to acknowledge the assistance and co-operation of all those whose

names appear in this report. I should also like to acknowledge the encouragement of Dr. Harrison Lewis and the kind direction of Dr. H. B. Speakman.

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BOOK REVIEW

LIFE HISTORY OF THE BLUE GOOSE, CHEN CAERULESCENS (LINNAEUS), by J. Dewey Soper, *Proc. Boston Soc. Nat. Hist.*, vol. 42, no. 2, pp. 121-225, plates 15-26, Boston, Massachusetts, November, 1942.

In this convenient and compact publication the author, who is well known as the first discoverer of a breeding-ground of the Blue Goose, summarizes the principal information contained in his previous brochure, "*The Blue Goose*," (Ottawa, 1930) and adds much information subsequently obtained. The entire annual cycle of this goose is treated in some detail, with special attention to the northward migration, particularly in Manitoba. There are separate sections on "Food and Feeding Habits" and "Protection". The illustrations consist of two maps and reproduction of a sketch and nine attractive photographs.

It is unfortunate that in this attempt by a recognized authority on the subject to present an up-to-date résumé of all available information relating to it, some important recent items have been omitted or barely mentioned. No reference is made to "*The Geese Fly High*" and "*Birds Across the Sky*", by Florence Page Jaques, both of which books contain detailed information about Blue Geese in the United States. T. H. Manning's important paper, "*Blue and Lesser Snow Geese on Southampton and Baffin Islands*", which was published in *The Auk* for April, 1942, is included in a list of "References" and is mentioned in the course of the "Life History", but without any attempt to include or to discuss his important data and conclusions. Despite the fact that a paper entitled "*Notes on Birds of the James Bay Region*

in the Autumn of 1940," which was published by Harold S. Peters and the present reviewer in *The Canadian Field-Naturalist* for November, 1941, is also included in the list of "References" accompanying the "Life History", the data therein contained are not utilized in the text of the latter publication, although an earlier and less satisfactory statement of numbers of Blue Geese seen on southern James Bay is taken from a letter by the reviewer that was written in 1935.

In the section devoted to "Protection" appears the statement that "Seven sanctuaries, in all, contribute directly to the protection and conservation of Blue Geese". There follows a list of six sanctuaries in Louisiana and Hannah Bay Bird Sanctuary, on the shores of James Bay, Canada, with a brief description of each sanctuary named. This list omits three other sanctuaries, one of them much larger than all other Blue Goose sanctuaries taken together, that have been established by the Government of Canada in James Bay. These three sanctuaries are as follows:

Twin Islands Game Sanctuary, Northwest Territories, containing 35,200 acres, established in 1939.

Boatswain Bay Bird Sanctuary, on the coast of the Province of Quebec, containing 38,400 acres, established in 1941.

Akimiski Island Bird Sanctuary, Northwest Territories, containing 701,000 acres, established in 1941.

Very likely some of these matters may be accounted for by a considerable lapse of time between completion of the author's manuscript and publication of the paper.—H. F. LEWIS.

CHRISTMAS BIRD CENSUS — 1942

PORT MOUTON, QUEEN'S CO., NOVA SCOTIA.— December 22, 1942; 9.00 a.m. to 1.00 p.m. Sky clear; 6 in. snow; no wind; temp. 25°. Observer on foot within 2 miles of Port Mouton. Red-throated Loon, 1; Black Duck, 11; American Golden-eye, 11; American Common Merganser, 4; Eastern Pigeon Hawk, 1; Nova Scotia Ruffed Grouse, 2; Great Black-backed Gull, 4; Herring Gull, 17; Atlantic Murre, 1; Black Guillemot (subspecies ?), 2; Blue Jay, 2; Northern American Raven, 2; Eastern Crow, 93; Black-capped Chickadee, 4; Eastern Golden-crowned Kinglet, 2; Common Starling, 4; Myrtle Warbler, 2; Slate-coloured Junco, 2. Total, 18 species, 165 individuals. (One Yellow Palm Warbler on December 16).—Harold F. Tufts.

WOLFVILLE, NOVA SCOTIA, — December 29, 1942; 10.30 a.m. to 5.00 p.m. Overcast; 10 in. crusted snow; no perceptible wind; temp. 20° at start. Three observers, sometimes together, sometimes separate. Observations within 10 miles of Wolfville. Travel chiefly by auto, with numerous side-trips on foot. Black Duck, 2; Green-winged Teal, 4; Golden-eye (probably American), 24; American Common Merganser 6; Nova Scotia Ruffed Grouse, 5; European Gray Partridge, 13; Common Pheasant, 11; Great Black-backed Gull, 1; Herring Gull, 25; Northern Flicker, 2; Hairy Woodpecker, 2; Blue Jay, 1; Northern American Raven, 2; Eastern Crow, 211; Black-capped Chickadee, 2; Eastern Robin, 1; Eastern Golden-crowned Kinglet, 2; Common Starling, 24; English Sparrow, 115; Canadian Pine Grosbeak, 11; Finch (probably Eastern Goldfinch), 4; Slate-coloured Junco, 11; Eastern Tree Sparrow, 12. Total, 23 species, 491 individuals.

(Blue Jays, Black-capped Chickadees, and White-breasted Nuthatches are abnormally scarce in this vicinity so far this winter. The Green-winged Teal are in a series of warm spring-holes, scattered over a few acres.)—R. W. Tufts, John Erskine and Rundall Lewis.

MONTREAL, QUE. — (Mount Royal, Westmount, Côte St. Luc, St. Lawrence River and South Shore from Caughnawaga to Longueuil.) — December 26, 1942; 9.00 a.m. to 5.00 p.m. Bright sunshine; snow depth 10 in.; moderate S.E. wind; temperature 10° at 9 a.m., 8° at 5 p.m. Observers in parties as follows: Party I (Mount Royal), 3 observers, 4 hours, 6 miles; Party II (Westmount), 4 observers, 2½ hours, 5 miles; Party III (Côte St.

Luc), 1 observer, 2½ hours, 5 miles; Party IV (Verdun), 1 observer, 3 hours, 5 miles; Party V (South Shore), 5 observers, 6 hours, 3 miles on skis, 15 miles by automobile. Total miles on foot, 24; total hours, 18. American Golden-eye, 116; American Common Merganser, 29; Peregrine Falcon, 1; Pigeon Hawk, 1; Ruffed Grouse, 2; Hungarian Partridge, 31; Common Pheasant, 48; Herring Gull, 7; Snowy Owl, 3; Hairy Woodpecker, 5; Downy Woodpecker, 15; American Crow, 1; Black-capped Chickadee, 17; White-breasted Nuthatch, 4; American Robin, 1; Common Starling, 560 (partly estimated); English Sparrow, 500 (estimated); Common Redpoll, 7; Snow Bunting, 43. Total, 19 species, approximately 1391 individuals. The Hungarian Partridges seen near Caughnawaga are the first of this species ever observed in the immediate vicinity of Montreal. Additional species observed the following day, Canada Jay. —Province of Quebec Society for the Protection of Birds.

HUDSON HEIGHTS, QUE. (including Whitlock Federal Government Bird Sanctuary; fields and woods within 5 miles of Masonic Temple Building, Hudson Heights, on the south side of Lac des Deux Montagnes, including, within this area, parts of Hudson and Como)—December 27, 1942; 10.00 a.m. to 5.00 p.m. (D. S.T.). Cloudy; about 2 ft. snow; wind north-east, moderate; sleet in afternoon; temp. 10° at start, 26° at return. Twenty-one observers in six parties. Total hours afield, 25¼ (22¼ by skis, 2½ on foot); total party miles, 34 (31 by skis, 3 on foot). Ruffed Grouse, 2; European Gray Partridge, 7; Hairy Woodpecker, 10; Downy Woodpecker, 8; Blue Jay, 69 (also 1 dead); Black-capped Chickadee, 96; White-breasted Nuthatch, 15; Red-breasted Nuthatch, 1; Brown Creeper, 1; Common Starling, 42; English Sparrow (no count kept); Common Redpoll, 19; White-winged Crossbill, 2 (others heard in flight); Tree Sparrow, 3; Snow Bunting, 2. Total, 15 species; 277 individuals plus English Sparrows.—Mrs. R. L. Puxley, Mrs. D. L. Macaulay, Miss Amy Clarke, Miss Marnie Clarke, Mr. and Mrs. E. D. Croll, Mr. and Mrs. Arthur Hill, Bruce Lancey, Douglas Haig, Geoffrey G. Ommanney, all of Hudson Heights; Dunbar Mullan, Orville Shaw, Russell Shaw, all of Hudson, P.Q.; N. M. Yuile, Como, P.Q.; Mr. and Mrs. L. McI. Terrill, Miss L. M.

Salices, A. M. Terroux, Wm. S. Yuile, all of Montrea, P. Q.; Dr. M. J. Dunbar, Godt-H-Aab, Greenland.

OTTAWA, ONT. (radially about city).—December 26, 1942; 7.15 a.m. to 4.30 p.m. Cloudiness ranged from 0 to 10%; 15 in. snow; wind very light, N.E. to S.E.; temp.—8° at start, maximum +8°; 12 observers in 8 parties. Total party hours on foot, 43.5; by car, 1; total party miles on foot, 71; by car, 10. American Golden-eye, 95; American Common Merganser, 13; Ruffed Grouse, 6; Common Pheasant 25; Rock Dove, 26; Hairy Woodpecker, 4; Downy Woodpecker, 10; Blue Jay, 10; American Crow, 32; Black-capped Chickadee, 53; White-breasted Nuthatch, 15; Brown Creeper, 1; Robin, 1; Starling, 266; English Sparrow, 887; Pine Grosbeak, 1; Redpoll Linnet, 16; American Goldfinch, 22; Snow Bunting, 161. Total, 19 species, 1644 individuals. (One Snowy Owl on December 23.) This census records a notable increase in the number of Common Pheasants, for the greatest number of this species included in any previous Christmas Bird Census at Ottawa is 4.—Ottawa Field-Naturalists' Club.

Observers: R. M. Anderson, Murray Curtis, R. E. DeLury, B. A. Fauvel, G. H. Hammond, T. S. Hennessy, W. H. Lanceley, C. R. Lewis, Harrison F. Lewis, Hoyes Lloyd, A. L. Rand, D. A. Ross.

PAKENHAM, LANARK CO., ONT.—December 24, 1942; 7.45 a.m. to 4.30 p.m. Overcast; sunlight for two hours in afternoon; 10 in. snow; wind light, south; temp. 36° at start, 38° at finish. Observers separate. One began at 11.00 a.m. 15 miles on foot. American Golden-eye, 16; Ruffed Grouse, 11; Hairy Woodpecker, 1; Blue Jay, 1; Black-capped Chickadee, 44; White-breasted Nuthatch, 11; Common Starling, 15; English Sparrow, 94; Common Purple Finch, 2; American Goldfinch, 53 (two flocks); White-winged Crossbill, 15; Slate-coloured Junco, 2; Snow Bunting, 84. Total, 13 species, 349 individuals. (American Goldfinch and Slate-coloured Junco appear for the first time in our Christmas census. Evening Grosbeak and Redpoll Linnet are present in the vicinity).—Edna G. Ross, Verna M. Ross.

COBOURG, ONT. (from Pratt's Pond, a small wildlife sanctuary 1 mile north of Cobourg, northeast to Baltimore through cedar woods along creek, returning through hardwoods and open fields). December 23, 1942; 9.00 a.m. to 5.30 p.m. Cloudy; 2 in. snow; wind very light,

west; temp. 31° at start, 32° at end; Pratt's Pond frozen over, creek partly so. Four observers in 1 party. Total party miles afoot, 9; total party hours afoot, 8. American Common Merganser, 5; Ruffed Grouse, 23; Common Pheasant, 3; American Screech Owl, 1; Great Horned Owl, 1; Hairy Woodpecker, 4; Downy Woodpecker, 4; Blue Jay, 1; Black-capped Chickadee, 45; White-breasted Nuthatch, 3; Brown Creeper, 1; Common Starling, 21; English Sparrow, 10; American Goldfinch, 25; Slate-coloured Junco, 7; Tree Sparrow, 3; Song Sparrow, 2; Snow Bunting, 480. Total 18 species, 639 individuals.—A. Lucas, A. Bruce, W. Spry, W. Waddell.

TORONTO, ONT.—December 27, 1942; 8.30 a.m. to 5.30 p.m. (E.D.T.). Cloudy and mild; 3 in. snow; light E. wind; light rain and sleet in morning; 66 observers in 29 groups. Common Loon, 1; Great Blue Heron, 1; Pintail, 2; Greater Scaup Duck, 1136; American Golden-eye, 348; Buffle-head, 47; Oldsquaw, 505; Hooded Merganser, 1; American Common Merganser, 44; Red-breasted Merganser, 20; Eastern Red-tailed Hawk, 8; Common Rough-legged Hawk, 2; Marsh Hawk, 2; Eastern Sparrow Hawk, 9; Ruffed Grouse, 11; Common Ring-necked Pheasant, 322; Glaucous Gull, 3; Great Black-backed Gull, 45; Herring Gull, 4944; Ring-billed Gull, 39; Eastern Screech Owl, 6; Great Horned Owl, 8; Snowy Owl, 3; Barred Owl, 1; American Long-eared Owl, 20; Short-eared Owl, 17; Acadian Owl, 2; Eastern Belted Kingfisher, 5; Northern Flicker, 3; Eastern Hairy Woodpecker, 23; Northern Downy Woodpecker, 76; Horned Lark, 5; Blue Jay, 125; Eastern Crow, 9; Black-capped Chickadee, 249; White-breasted Nuthatch, 67; Red-breasted Nuthatch, 47; Brown Creeper, 18; Winter Wren, 3; Carolina Wren, 1; American Robin, 8; Eastern Golden-crowned Kinglet, 22; Cedar Waxwing, 9; Northern Shrike, 1; Common Starling, 1634; English Sparrow, 2165; Eastern Meadowlark, 7; Eastern Redwing, 6; Bronzed Grackle, 1; Eastern Cardinal, 57; Eastern Purple Finch, 48; Common Redpoll, 5; Pine Siskin, 23; American Goldfinch, 214; Red Crossbill, 2; Slate-coloured Junco, 340; Tree Sparrow, 292; White-throated Sparrow, 2; Swamp Sparrow, 2; Song Sparrow, 21; Snow Bunting, 265. Total, 61 species, 13,302 individuals.—J. L. Baillie, F. Banfield, G. S. Bell, A. Boissoneau, F. S. Cook, A. Cringan, J. Crosby, C. Davies, Mrs. Davies, O. E. Devitt, R. G. Dingman, Y. Edwards, F. H. Emery, B. Falls, A. Fryer, R. Fryer, W. Giles, H. M. Halliday, P. Har-

12 parties and at 5 separate feeding stations. rington, R. Hicks, C. E. Hope, R. F. James, M. Jarrett, G. Kennedy, R. Lanning, R. V. Lindsay, J. Link, J. MacArthur, J. W. MacArthur, R. MacArthur, D. MacDonald, C. MacFayden, T. F. McIlwraith, N. D. Martin, Mrs. Mitchell, T. R. Murray, H. Nickle, K. Neilsen, A. Outram, J. Outram, B. Perrin, D. Perks, B. Proctor, B. Proctor, C. Proctor, H. Proctor, R. Ritchie, R. Robinson, R. Russell, T. Russell, R. J. Rutter, R. Sachs, R. M. Saunders, D. Scovell, west at return; temp. -15° at start, 7° at return; bay frozen. 33 observers working in Total hours afield, 72; total party miles, 156 T. M. Shortt, W. E. Shore, Mrs. Sisman, L. L. Snyder, F. Smith, R. A. Smith, W. W. Smith, H. Southam, S. L. Thompson, D. West, J. Wheeler, D. Wilson.—(The Brodie Club). lington, Aldershot). — December 20, 1942; 8.40 a.m. to 6.30 p.m. (D.S.T.). Clear; 3 in. to 7 in. snow; slight north breeze veered to

HAMILTON, ONT. (Dundas Valley west to Ancaster, Hamilton, and Harbor, Beach, Burfoot. Common Loon, 1; Black-crowned Night Heron, 1; Black Duck, 16; Ring-necked Duck, 2; Greater Scaup Duck, 215; Lesser Scaup Duck, 80; American Golden-eye, 51; Bufflehead, 1; Oldsquaw, 19; White-winged Scoter, 11; American Common Merganser, 6; Red-breasted Merganser, 4; Sharp-shinned Hawk, 1; Cooper's Hawk, 5; Red-tailed Hawk, 10; Common Rough-legged Hawk, 8; Marsh Hawk, 1; Ruffed Grouse, 4; European Gray Partridge, 15; Common Pheasant, 109; Glaucous Gull, 1; Great Black-backed Gull, 45; Herring Gull, 600 (est.); American Screech Owl, 2; Great Horned Owl, 8; American Long-eared Owl, 1; Belted Kingfisher, 1; Hairy Woodpecker, 15; Downy Woodpecker, 78; Horned Lark, 8; Blue Jay, 55; American Crow, 7; Black-capped Chickadee, 204; White-breasted Nuthatch, 27; Red-breasted Nuthatch, 1; Brown Creeper, 9; Long-billed Marsh Wren, 1; American Robin, 6; Golden-crowned Kinglet, 11; Cedar Waxwing, 77; Common Starling, 1689 (est.); English Sparrow, 1212 (est.); Eastern Meadowlark, 11; Eastern Redwing, 1; Cowbird, 1; Eastern Cardinal, 23; Common Purple Finch, 2; Common Redpoll, 2; American Goldfinch, 61; Slate-coloured Junco, 356; Tree Sparrow, 229; Song Sparrow, 12; Snow Bunting, 33. Total, 53 species; approximately 5354 individuals. The Bourne party examined the Night Heron in a tree at fifty feet; North flushed the Marsh Wren from rushes.—Don Neil, and Mr. and Mrs.

R. D. F. Bourne, Vernon Bruck, John Butcher, Jack Campbell, Wm. Campbell, Mrs. A. R. Clarke, Mrs. J. G. Farmer, Jean Gall, Oliver Hewitt, J. E. Hill, A. B. Jackson, H. E. Kettle Frank Kroeger, Mrs. F. E. MacLoughlin, Miss J. M. Magee, Eleanor Malcolm, Jack Martin, Douglas McCallum, Miss M. McIlwraith, G. O. McMillan, Ruby Mills, G. W. North, Jack Roser, Rev. and Mrs. W. E. Sibley, Mr. and Mrs. J. M. Speirs, Miss M. E. Stambaugh, Laura Stewart, J. H. Williams (members Hamilton Nature Club).

KITCHENER AND WATERLOO, ONT.—December 26, 1942; 10.30 a.m. to 5.30 p.m. (E.D.T.). Overcast; nearly 1 ft. snow; wind easterly, fresh to strong; temp. 15° to 28° . 12 observers in 5 parties and 4 casual contributors. Mallard Duck, 1; Black Duck, 3; Common Golden-eye, 8; Common Merganser, 5; Red-tailed (?) Hawk, 1; Ruffed Grouse, 6; Common Pheasant, 3; Herring Gull, 1; American Screech Owl, 1; Great Horned Owl, 2; Snowy Owl, 1; Downy Woodpecker, 13; Blue Jay, 4; Black-capped Chickadee, 26; White-breasted Nuthatch, 2; Red-breasted Nuthatch, 3; Brown Creeper, 2; Golden-crowned Kinglet, 10; Common Starling, 115 plus; English Sparrow, 215 plus; Cardinal, 3; Common Purple Finch, 20; American Goldfinch, 2; Slate-coloured Junco, 18; Snow Bunting, about 20. Total, 25 species, about 485 individuals. (One, perhaps two, Red-shouldered Hawks, January 1, 1943; 1 Belted Kingfisher, January 1; 14 Cedar Waxwings, January 2; 1 male Evening Grosbeak, December 5; 21 American Goldfinches, January 1; 3 Lapland Longspurs, January 2).—Albert Arndt, William Bergey, Walter Bergman, Gordon Bingeman, Robert Bowman, Jack Crawford, F. W. R. Dickson, John Gellman, Jack George, Ted Hegmeier, G. W. Knechtel, Dick Malcolm, Harold Miller, F. H. Montgomery, C. B. Price, Donald Price.

WOODSTOCK, ONT.—December 27, 1942; 9.00 a.m. to 3.30 p.m. Cloudy all day; 10 in. crusted snow; coating of ice on trees melted as day progressed; heavy rain started 2.50 p.m.; wind light, south, increasing; temp. at 9.00 a.m., 34° . 7 observers in 3 parties. Total party hours, $14\frac{1}{2}$; total mileage, 10 miles by auto, 24 miles on foot. Great Blue Heron, 1; Sharp-shinned Hawk, 1; Red-tailed Hawk, 2; Ruffed Grouse, 4; Common Pheasant, 11; Rock Dove, 34; Hairy Woodpecker, 2; Downy Woodpecker, 4; Blue Jay, 13; American Crow, 6; Black-capped Chickadee, 144; White-breasted Nuthatch, 5; Brown Creeper, 3; Golden-crowned

Kinglet, 6; Common Starling, 225 (est.); English Sparrow, 610 (est.); Cardinal, 13; Common Redpoll, 22; Pine Siskin, 15; American Goldfinch, 45; Slate-coloured Junco, 162; Tree Sparrow, 17; Song Sparrow, 1; Snow Bunting, 630 (est.). Total, 24 species, 1976 individuals. — R. Brookfield, Ed. Dutton, H. Milnes, G. L. Nutt, H. Sivyer, D. Zufelt, L. Zufelt. (*Woodstock Naturalist Society*).

LONDON, ONT. (vicinity of), Thames River Valley to a point about 10 miles west of city.— December 26, 1942; 8.30 a.m. to 4.00 p.m. Overcast all day; 10 in. crusted snow; wind E., strong; temp. at start 26°. 18 observers in 8 parties and 11 observers at 6 feeding stations. Total hours afield, 23; 19 on foot, 4 by auto. Great Blue Heron, 1; Black Duck, 3; Common Golden-eye, 79; Buffle-head, 1; Common Merganser, 113; Red-tailed Hawk, 4; Red-shouldered Hawk, 1; Common Rough-legged Hawk, 1; Bald Eagle, 1; Herring Gull, 13; American Screech Owl, 2; Great Horned Owl, 2; Hairy Woodpecker, 6; Downy Woodpecker, 19; Horned Lark, 8; Blue Jay, 37; American Crow, 5; Black-capped Chickadee, 207 plus; White-breasted Nuthatch, 25; Brown Creeper, 8; Golden-crowned Kinglet, 24; Cedar Waxwing, 1; Common Starling, 73; English Sparrow, 425; Cardinal, 41; Common Redpoll, 20; American Goldfinch, 3; Slate-coloured Junco, 41; Tree Sparrow, 8; Snow Bunting, 8; Total, 30 species, 1180 plus individuals. — *McIlwraith Ornithological Club* (N. Rae Brown, Ronald Crawley, Eli Davis, Jim Eadie, Kathleen Fetherston, Marjorie Fetherston, E. Frith, Frances Girling, Roger Hedley, J. C. Higgins, G. W. Hofferd, Doris Hughes, Allen Loughrey, Hugh McMahon, J. C. Middleton, William A. Morris, A. G. Sabine, W. E. Saunders, Bob Spittle, Jean Spring, Miller Stuart, Mrs. M. Stuart, Sandy Stuart, Charles Whitelaw).

CHATHAM, ONT.—December 29, 1942, 9.00 a.m. to 5.30 p.m. Sky heavy clouds; fog and mist in forenoon; ½ in. soft snow in sheltered places; open fields very muddy; Lake St. Clair frozen out four miles; Lake Erie open; temp. 48° to 53°. 7 observers in two cars worked in the environments of Tilbury, Jeannette's Creek, Erieau, Blenheim, Bradley's Marsh, Mitchell's Bay and Thamesville, 9.00 a.m. to 5.30 p.m. 2 observers in one car followed creek road from Chatham to Ridgetown, 2.00 to 4.30 p.m. 13 separate observers took notes part time near their homes. Black-crowned Night Heron, 1; Canada Goose, 8; Mallard

Duck, 206; Black Duck, 54; Canvas-back, 5; Lesser Scaup Duck, 10; Common Golden-eye, 4; Hooded Merganser, 5; Common Merganser, 537; Red-breasted Merganser, 6; Sharp-shinned Hawk, 3; Cooper's Hawk, 3; Red-tailed Hawk, 6; American Rough-legged Hawk 16; Bald Eagle, 1; Marsh Hawk, 3; American Sparrow Hawk, 1; Bob-white, 16; Common Pheasant, 14; Herring Gull, 38; Ring-billed Gull, 50; Rock Dove, 105; Mourning Dove, 25; Screech Owl, 4; Great Horned Owl, 8; Snowy Owl, 1; American Long-eared Owl, 27; Short-eared Owl, 5; Hairy Woodpecker, 8; Downy Woodpecker, 25; Blue Jay, 14; American Crow, 3,299; Black-capped Chickadee, 30; White-breasted Nuthatch, 19; Brown Creeper, 4; American Robin, 8; Golden-crowned Kinglet, 19; Ruby-crowned Kinglet, 1; Cedar Waxwing, 10; Northern Shrike, 1; Common Starling, 374; English Sparrow, 1,440; Eastern Meadowlark, 1; Eastern Red-wing, 1; Rusty Blackbird, 1; Bronzed Grackle, 251; Cowbird, 28; Cardinal, 41; American Goldfinch, 1; Slate-coloured Junco, 45; Tree Sparrow, 244; Song Sparrow, 7; Snow Bunting, 1000 (est.). Total, 53 species, approximately 8,039 individuals. Seen recently, Whistling Swan, Red-headed Woodpecker. *Observers*: K. C. Annable, D. A. Arnott, Miss Melba Bates, Dr. C. C. Bell, J. A. Dunlop, H. English, C. H. Hand, F. Jordan, J. Keil, W. Kellar, G. McGarvin, G. R. McGregor, J. O. Moore, M. Morgan, S. Rozell, M. Sass, W. Sass, Dr. Geo. M. Stirrett, A. A. Wood, Mary Wood, D. Harry Young, C. H. Zavitz. (*Kent Nature Club*), A. A. Wood, *Chairman, Bird Census Committee*.

BRADFORD, SIMCOE COUNTY, ONTARIO—December 26, 1942; 10.00 a.m. to 4.00 p.m. Clear; 6 in. snow; wind N.W., moderate; temp. 2° to 15°. 4 miles on foot along Holland River, S.W. from Bradford, and return. Observers together. Ruffed Grouse, 3; Common Ring-necked Pheasant, 2; Eastern Hairy Woodpecker, 2; Northern Downy Woodpecker, 3; Blue Jay, 1; Black-capped Chickadee, 20; White-breasted Nuthatch, 1; Red-breasted Nuthatch, 2; Brown Creeper, 2; Eastern Golden-crowned Kinglet, 4; Common Starling, 2; English Sparrow, 5; Eastern Purple Finch, 23; American Goldfinch, 25; Slate-coloured Junco, 3. Total, 15 species, 93 individuals.— W. W. Smith and O. E. Devitt.

BARRIE, ONTARIO—December 26, 1942; 9.30 a.m. to 6.00 p.m. Clear; 12 in. snow; bitter N.W. wind; Kempenfeldt Bay frozen over; temp. at start —5°. Observers together, 25

miles by auto, 10 miles on foot. Ruffed Grouse, 3; Common Pheasant, 3; Herring Gull, 1; Rock Dove, 25; Great Horned Owl, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 2; Downy Woodpecker, 1; Blue Jay, 15; Black-capped Chickadee, 4; White-breasted Nuthatch, 2; Red-breasted Nuthatch, 1; Golden-crowned Kinglet, 3; Northern Shrike, 1; Common Starling, 50; English Sparrow, 100; Evening Grosbeak, 25; Common Purple Finch, 16; American Goldfinch, 32 (a flock, feeding on hemlock seeds); Slate-coloured Junco, 3; Tree Sparrow 20; Snow Bunting, 1. Total, 22 species, 311 individuals. (Ruffed Grouse decreasing; Black-capped Chickadees scarce. 2 Snowy Owls seen earlier in month.) — Edwin Laws, E. L. Brereton.

MEAFORD, ONTARIO (from town 2 miles east along shore, also small part of escarpment). —December 28, 1942. Dull; cold; wind strong N.E. American Golden-eye, 3; American Common Merganser, 48; Ruffed Grouse, 1; European Gray Partridge, 3; Herring Gull, 100 plus; Hairy Woodpecker, 2; Blue Jay, 12; American Crow, 1; Black-capped Chickadee, 30; White-breasted Nuthatch, 2; Golden-crowned Kinglet, 2; Cedar Waxwing, 3; Common Starling, 50 plus; English Sparrow, 75 plus; Pine Grosbeak, 7; Common Redpoll, 8; Snow Bunting, 10. Total, 17 species, 357 plus individuals.—L.H. Beamer.

OWEN SOUND, ONTARIO.—December 27, 1942; 11.00 a.m. to 6.00 p.m. Cloudy; wind S.W.: heavy rain most of the day; temp. 35°. Holboell's Grebe, 2; Black Duck, 2; American Golden-eye, 5; American Common Merganser, 28; Herring Gull, 79; Blue Jay, 2; Black-capped Chickadee, 10; American Robin, 1; Common Starling, 161; English Sparrow, 172. Total, 10 species, 462 individuals. (Also 1 semi-domesticated Mute Swan.)—Alf. Bunker.

FORT WILLIAM—PORT ARTHUR, ONTARIO (area 15 miles W. of two cities).—December 29, 1942; 1.30 p.m. to 4.30 p.m. Clear; 10 in. snow; temp. 15° to 20°. Little open water available. 3 observers in one party; 40 miles by auto. Pigeon Hawk, 1; Ruffed Grouse, 2; Herring Gull, 15; Canada Jay, 3; Black-capped Chickadee, 1; Common Starling, 6; English Sparrow, 10; Pine Grosbeak, 10. Total, 8 species, 48 individuals. Seen recently: Cooper's Hawk, Hairy Woodpecker, Blue Jay, Raven, American Robin, Bohemian Waxwing, Evening Grosbeak.—A. E. Allin, D. Beckett, G. K. Eoll. (*Thunder Bay Field-Naturalists' Club*).

YORKTON, SASKATCHEWAN (area 15 miles in diameter, with Yorkton as centre).—December 27, 1942; 10.00 a.m. to 5.30 p.m. Clear; thin covering of snow; wind strong, S.E.; temp. —5° at start, 5° at 2.00 p.m., —10° at finish. 9 observers in 7 groups. Total party hours afield, 11- (4 by car and 7 on foot); total party miles, 77½ (64 by car, 13½ on foot). Sharp-tailed Grouse, 22; Hungarian Partridge, 15; Great Horned Owl, 1; Downy Woodpecker, 2; American Magpie, 2; Black-capped Chickadee, 19; Bohemian Waxwing, 43; English Sparrow, 188 (est.); Redpoll (sp.?), 35 (est.); Snow Bunting, 426 (est.). Total, 10 species, approximately 753 individuals. Snowy Owls, common for the past 2 months, have now left this district. Abundance of Snow Buntings attributed to thinness of snow covering. No Grosbeaks noted so far this winter. — Vernon Barnes, Brother Clarence, Dr. C. J. Houston, Dr. S. C. Houston, C. Stuart Houston, Ethel Lloyd, Mrs. I. M. Priestly, Michael Priestly, Jim Rogerson (members *Yorkton Natural History Society*).

CRESCENT, B. C. (coastline and bushland between Crescent and Ocean Park).—December 30, 1942; 9.00 a.m. to 4.00 p.m., P.D.T. Overcast; sleet with N.E. wind in afternoon made visibility poor; temp. 34° at sunrise, rising slightly during day. 4 observers in one party. About 8 miles on foot. Common Loon, 11; Pacific Loon, 2; Holboell's Grebe, 1; Horned Grebe, 7; Western Grebe, 2; Cormorant (sp?), 1; Northwest Coast Heron, 3; Black Brant, 25 (est.); Mallard Duck, 6; Green-winged Teal, 8; Canvas-back, 10; Greater Scaup Duck, 500 plus; American Golden-eye, 15; Buffle-head, 16; Harlequin Duck, 11; White-winged Scoter, 200 plus; Surf Scoter, 200 plus; American Scoter, 4; Red-breasted Merganser, 2; Bald Eagle, 1; Common Pheasant, 3; Red-backed Sandpiper, 100 (est.); Glaucous-winged Gull, 20; Short-billed Gull, 1; Belted Kingfisher, 1; Northwestern Red-shafted Flicker, 8; Northwestern Crow, 2; Oregon Chickadee, 8; Chestnut-backed Chickadee, 1; Winter Wren, 4; Varied Thrush, 6; Golden-crowned Kinglet, 17; Ruby-crowned Kinglet, 1; Audubon's Warbler, 3; Western Meadowlark, 1; Pine Siskin, 50 (est.); Oregon Towhee, 4; Oregon Junco, 5; Puget Sound Sparrow, 5; Sooty Fox Sparrow, 1; Rusty Song Sparrow, 13. Total, 41 species, 1279 plus individuals. (Dec. 23, Aleutian Sandpiper and Northwestern Robin. Dec. 24, California Murre and Snow Bunting.) Very few Oregon Juncos, as compared with previous years.—Martin W. Holdom, Mary W. Holdom, Frances E. L. Holdom, Robert Neil.

COURTENAY-COMOX, VANCOUVER ISLAND, B.C. (through town, around river, and side trips to cultivated area, estuary, and sea beach.)—December 22; 8.00 a.m. to 4.30 p.m. Sunny; calm; temp. 32° at start, 36° at return; weather has been mild. Observers together; 8 miles on foot. Lesser Loon, 6; Red-throated Loon, 1; Holboell's Grebe, 5; Horned Grebe, 1; Western Grebe, 3; Pied-billed Grebe, 1; White-crested Cormorant, 7; Pelagic Cormorant, 3; Northwest Coast Heron, 2; Mallard Duck, 285 plus; Baldpate, 170 plus; Greater Scaup Duck, 251 plus; American Golden-eye, 278 plus; Barrow's Golden-eye, 5; Buffle-head, 12; White-winged Scoter, 500 plus; Surf Scoter, 300 plus; American Scoter, 20 plus; Hooded Merganser, 9; American Common Merganser, 9; Red-breasted Merganser, 8; Western Red-tailed Hawk, 2; Bald Eagle, 2; California Quail, 1; Common Pheasant, 16; American Coot, 11; Killdeer Plover, 75; Glaucous-winged Gull, 15,000 (est.); Thayer's

Gull, 1,500 (est.); Short-billed Gull, 150 plus; Western Belted Kingfisher, 3; Northwestern Red-shafted Flicker, 7; Harris's Woodpecker, 4; Gairdner's Woodpecker, 1; Steller's Jay, 6; Western Crow, 10 plus; Northwestern Crow, 1150 plus; Chestnut-backed Chickadee, 7; Western Winter Wren, 3; Pacific Varied Thrush, 5; Western Golden-crowned Kinglet, 6; Sitka Kinglet, 2; Audubon's Warbler, 1; English Sparrow, 10; Brewer's Blackbird, 20; Common Purple Finch, 4; Oregon Towhee, 10; Oregon Junco, 50; White-crowned Sparrow, 2; Rusty Song Sparrow, 24; Total, 50 species, 19,958 plus individuals. Audubon Warbler and White-crowned Sparrow absolutely identified at close quarters, latter perhaps *pugetensis*. Estimated additional 3,000 distant, unidentified ducks, probably White-winged and Surf Scoters in proportions of numbers counted. Geographical races assumed.—Theed Pearce, A. R. Davidson.

BOOK REVIEW

COMMON EDIBLE AND POISONOUS MUSHROOMS OF SOUTHEASTERN MICHIGAN. By Alexander H. Smith; *The Cranbrook Institute of Science, Bloomfield Hills, Michigan, Bulletin No. 14, 72 pp., frontis., 15 pls., 1 figure. December, 1938. Paper 50c; cloth, \$1.00.*

This book is designed primarily for the beginner who wishes to collect mushrooms for the table. It is intended to be used in the field or at home rather than in the laboratory, and microscopic characters are not included in the descriptions. Forty-four species which the author has found commonly in Michigan are described. These include not only true mushrooms or gill-fungi, but representatives of other groups of fleshy fungi. Keys to the genera and species are presented which should prove of great assistance in identification, but the author points out that these keys are, of necessity, very incomplete, consequently the collector

will find many species which cannot be placed by means of them. Twenty-nine species are illustrated by excellent photographs.

A feature which should prove very helpful to the beginner is a summary of the species likely to be found at different seasons in different habitats. A number of recipes for preparing mushrooms for the table is included. There is also a description of the parts of a mushroom, illustrated by diagrams, and a glossary of the scientific terms is provided.

It should be realized that the species described in this book are those most commonly found in Michigan, and that in other parts of the country some of the species described here may be rare or absent, while some more common species may not be found in this book. The author emphasizes once more that the only way to distinguish edible and poisonous mushrooms is to learn to know the species.

J. W. GROVES.

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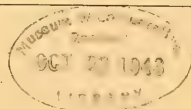
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ON SOME BRITISH COLUMBIA BIRDS ^{1, 2}

By A. L. RAND,

National Museum of Canada, Ottawa

FIELD PARTIES from the National Museum of Canada studied the bird life of the central British Columbia coast from northern Vancouver Island to the Bella Coola area during the period 1935-1938. Mr. H.M. Laing who was in charge of the parties has published some of the more interesting records obtained (1942, *Condor*, 44, pp.175-181) I have prepared a report on the complete collection, but as its publication may be indefinitely delayed I am presenting here some of the more interesting records. Mr. Laing's excellent field notes have been freely drawn upon, and I have also included some data from other sources that have accumulated at the National Museum. In the following "Brooks and Swarth, 1925" refers to Brooks and Swarth, 1925, A Distributional List of the Birds of British Columbia, *Pacific Coast Avifauna*, No. 17, Berkeley, California.

Branta canadensis occidentalis (Baird)
WHITE-CHEEKED GOOSE.

First seen on north Vancouver Island on the arrival of the 1935 party at Port Hardy in late August. The geese remained there during the party's stay (Aug. 21-Sept. 4). Probably they were locally raised birds. Numbers were seen around the north end of the island to Quatsino (Oct. 2.); some of these were perhaps migrants.

In 1936 a party of 8 geese, probably a family of local birds, was seen August 13 on Bute Inlet; and during the stay on Kingcome Inlet Sept. 9 to Sept. 26 a few small flocks stayed on the tidal flats. The local people said these geese had been raised locally.

In the Rivers Inlet area in 1937 this goose was a common resident, apparently breeding wherever conditions were favorable. All specimens taken were in breeding condition. The broods with the parents were all small; one pair had but one young, another 4 and another 2.

The first part of August the adults were strong on the wing, as were the young.

These birds are said to pass the winter on Calvert Island, using the beaches when the lakes were frozen, and on the Shumahalt River flats of Owikeno Lake.

In 1938 this goose was reported at Stuié in June, a small flock on the wing. They were said to have bred formerly in a slough of the river near the Bryneldsen Pool; on July 18 Laing found a deserted nest with 5 eggs in the Bryneldsen meadow, a mile above Stuié.

Eight specimens were taken; 1 ♂ imm., 1 ♀ ad., Port Hardy, Aug. 24, 1935; 2 ♂ ad., 2 ♀ ad., 1 ♂ imm., 1 ♀ imm., Calvert Island, Aug. 3-5, 1937. These agree well with Queen Charlotte Island birds (*occidentalis*) in their dark underparts, and in size, and differ strikingly from the pale breasted *canadensis* from southern British Columbia.

This extends the known breeding range of this form southward from the Queen Charlotte Islands.

The weights of the specimens were, male adult, 9 and 10 lbs., (the latter thin); immature male, 8.5 lbs.; adult female, 8.25 and 8.5 lbs.; immature female, 6 lbs.

Columba fasciata fasciata Say BAND-TAILED
PIGEON

Patch's Bella Coola record (1922, *Can. Field-Nat.* 36, p. 133) is based on a feather picked up there by H. I. Smith and identified by Mr. Taverner. Laing, in 1938, secured additional data from the area. He found a few summering in the valley, seeing them in June at Hagensborg, and in June and July at Stuié, where he thought they bred (no specimens).

In a letter in the Museum files from Mr. Will Robinson of Terrace, B.C., dated Aug. 26, 1928, he states that Mr. Frickman of Terrace saw a number of Band-tailed Pigeons through the early summer. After they banded together, when one flock of about 100 was seen in late July, they disappeared.

Further south, in 1937 Laing found them in the Rivers Inlet region near McLaughlin Creek (June 30, a flock of 10 or 15, another giving mating display), Owikeno Lake (about July 17 to 21, occasionally seen) and Rivers Inlet cannery, (1 seen, Aug. 13). In 1936 he

1 — Published with permission of The Director, Mines and Geology Branch, Department of Mines and Resources, Ottawa, Canada.

2 — Received for publication, Feb. 5, 1943.

recorded them at Fawn Bluff (scarce, 1 or 2 seen), Thurlow Island (2 seen), Stuart Island, (2 seen, July 21) and Horseshoe Lake, (fairly common June 19 to July 18) (no specimens).

Apparently the species occurs in numbers and probably nests at least occasionally as far north as the lower Skeena River.

Tyrannus verticalis Say. ARKANSAS KINGBIRD

Brooks and Swarth (1925, p.73) had no definite record for Vancouver Island. There is a specimen in the National Museum from Ucluelet taken by C. H. Young June 19, 1909. There is now a sight record for near Comox (1931, *Murrelet*, 12, p. 83).

Empidonax traillii traillii (Audubon) ALDER
FLYCATCHER

Two specimens from the Bella Coola area (Kimsquit, 1 ♂ ad., July 13, 1939; and Hagensborg, 1 ♂ ad., July 6, 1938) agree with eastern birds in their greenish upperparts, distinct wing bars and small bills. This represents the south-westerly limit of the range of this form.

Empidonax traillii brewsteri Oberholser
LITTLE FLYCATCHER

An adult male and female from Horseshoe Lake, Stillwater, June 21 and July 2, 1936, are closer to specimens of this race from southern British Columbia than they are to the Bella Coola birds (*traillii*). They are somewhat intermediate, as the female with a very large bill has rather distinct wing bars, and the male, with obscure wing bars, has a small bill, but they are best referred to this race which thus is near its northwestern limit at this point. I have seen no specimens of *adustus* Oberholser.

Empidonax hammondi (Xantus)

HAMMOND'S FLYCATCHER

Brooks and Swarth (1925, p.75) give this species as reaching the coast only in the south. That it occurs along the coast as far as Dean Channel is shown by the following specimens from the Museum expeditions: Horseshoe Lake ♂, ♀, July 2, 12, 1936; Stuart Island, 2 ♂, July 22, 28, 1936; Rivers Inlet, 1 ♂, July 14, 1937; Hagensborg, 1 ♂, 1 ♀, June 14, July 8, 1938; Kimsquit, 4 ♂, June 20-July 7, 1939. No specimens of *wrightii* were taken in this area.

Myiochanes richardsoni richardsoni (Swainson)
WESTERN WOOD PEEWEE

Two specimens from Hagensborg, June 13 and 15, 1938, extends the known range northward in the coastal area from the vicinity of Vancouver and Alta Lake.

Petrochelidon albifrons albifrons (Rafinesque)
CLIFF SWALLOW.

Brooks and Swarth (1925, p. 104) said that the Cliff Swallow had not been found on Vancouver Island, nor northward along the coast, and there appear to be no subsequent published records for this area. We have no pertinent specimens, but a number of manuscript notes that have accumulated in the National Museum as follows: Comox, V. I.- common throughout the summer, 1922, breeding on the buildings in Comox village; flocks of swallows worked over the camp and the nearby tidal meadows and these always included a number of Cliff Swallows; recorded June 28 to Aug. 15 (*Ms.* P. A. Taverner); has bred there every year since (letter, 1933, H. Laing): Duncan Station, V. I. - a colony established itself in a barn at Duncan Station, V. I. during the war (1914-1918) and have now (1927) spread to several other colonies in the neighborhood (letter, G. D. Sprot): Saanich Peninsula, Cobble Hill, Duncan and Chemainus, V.I. - quite common; (letter G. D. Sprot): Coal Harbor, V. I. - one seen July (letter, 1933, H. M. Laing): Sayward, V.I.- two seen Aug. 13, 14 and a nest or two on barn; (*Ms.* 1936, H. M. Laing): Rivers Inlet - a pair took up residence at the cannery, they were seen June 5 and several times later, then disappeared (*Ms.* 1937, H. M. Laing).

Perisoreus canadensis griseus Ridgway
GRAY JAY

Specimens taken at Horseshoe Lake, Stillwater (1 ♂ ad., 2 ♀ ad., 1 ♂ imm., 1 ♀ imm., June 20-23, 1936) and in the lowlands of the Bella Coola area (Hagensborg, 1 ♂ ad., 2 imm., June 25, July 2, 1938 and Kimsquit, 1 ♂ ad., 1 ♀ imm., July 12, 21, 1939) extends the known range of this form northward from Alta Lake and Lillooet.

These specimens are indistinguishable from Vancouver Island birds.

It is interesting that the coastal lowland birds are this form, while inland, in the mountains above Stue the quite different *canadensis* occurs.

Laing's notes however record that the species was common from the valley floor to timber line in the Bella Coola area. A series of specimens from intermediate localities would be very desirable, to demonstrate what happens when *canadensis* and *griseus* meet.

Taverner has suggested that this form intergrades with *canadensis* (1938 *Birds of Canada*, p. 303). While I agree with him that the differences shown by *obscuris* and *canadensis* are only of subspecific value, and the two forms certainly represent each other in this area, my material does not demonstrate intergrading. The Hagensborg and Kimsquit birds, with brownish tinged plumage, shaft streaks of the feathers conspicuous, and very reduced white tips to the remiges, contrast with the Stuie mountain birds with blue grey unstreaked plumage, and larger white tips to the remiges.

Dendroica magnolia (Wilson)

MAGNOLIA WARBLER

There seems to be but a single British Columbia record south of Tacla Lake and Quesnel, the one from Field; (Brooks and Swarth, 1925, p.109), so it is advisable to place on record a specimen, an adult male taken July 25, 1890 by Spreadborough at Revelstoke.

Seiurus noveboracensis linnaeus McCabe and Miller.

BRITISH COLUMBIA WATER-THRUSH

The 1938 party made several sight records of water-thrushes at Stuie between June 13 and July 26. The birds were occasionally heard in song.

A specimen taken July 22, at Stuie was a female with wing length of 72 mm. In its darker colored upperparts it agrees better with five specimens of this race from Hazelton, Vanderhoof, Yahk and Elko than it does with four specimens of *notabilis* from Chitina River, Glacier, Alaska.

A specimen taken at Loughborough Inlet on Aug. 27, 1936, was probably a migrant. It is a female, with a wing length of 73 mm. In color of upperparts it compares well with specimens of this species from Alaska, but below is somewhat yellow and cannot be distinguished with certainty from some eastern specimens.

Pinicola enucleator carlottae Brooks

QUEEN CHARLOTTE PINE GROSBEEK

Brooks (1939, *Murrelet*, 20, p. 57-59) has recorded this race from Vancouver Island, as accidental at Okanagan and has suggested it may be the breeding bird of the coastal ranges; Laing, 1942, *Condor*, p. 181 suggests the same thing. Laing on Rivers Inlet found this species from June 26 to Sept. 8, 1937 and took several specimens. In identifying them I have gone over all the British Columbia material in the National Museum as follows: Queen Charlotte Is., 1 ♂, 1 ♀, July 15, 1910; Lillooet, 1 ♂, 1 ♀, July 11, 19, 1916; Head of Rivers Inlet, 1 ♂, 1 ♀, 1 sex?, July 2, -3, 1937; Rossland, 1 ♂, 1 ♀, July 15, 16, 1929; 1st Summit Skagit River, 1 ♂, Aug. 18, 1905; and Osoyoos 1 ♀, Sept. 28, 1928.

The measurements are given in Table I. Except for the September specimen these may be considered breeding birds.

Table I

| | | Wing | | Exposed Culmen | |
|---------------------------|-------------------|------------|----------------|----------------|--------------|
| | | ♂ | ♀ | ♂ | ♀ |
| Queen Charlottes | July 15, 1910 | 113 (red) | 105 | 14.7 | 14 |
| Lillooet | July 11, 19, 1916 | 116 (red) | 111 | 15 | 14.5 |
| Rivers Inlet | July 2, 3, 1937 | 107 (grey) | 108 (108 sex?) | 14.2 | 15 (15 sex?) |
| 1st Summit, Skagit River, | Aug. 18, 1905 | 113 (grey) | | 14.5 | |
| Osoyoos | Sept. 28, 1928 | | 116 | | 14.5 |
| Rossland | July 15, 16, 1929 | 113 (red) | 114 | 16 | 15 |

On the basis of size it does not seem possible to separate any of these birds. I have no topotypical *montana* but Ridgeway's (1901, *Bull. U.S. Nat. Mus.* No. 50, p.60) measurements for *montana* wing ♂ 119.89 - 123.44, ♀ 118.11 - 119.13; exposed culmen ♂ 15.49 - 17.27 are so much larger that it seems advisable to consider all these birds *carlottae* in size.

In color the Osoyoos female is considerably paler than any of the others, but otherwise there appear to be no significant differences.

It appears that the breeding range of this race may be much larger than has been thought.

Passerculus sandwichensis anthinus Bonaparte
NORTHWESTERN SAVANNA SPARROW

This species was a summer resident in the Bella Coola area and probably bred there.

Specimens were collected as follows: an adult male at Hagensborg, July 2, and another at Kimsquit, July 12, 1939, and a female Aug. 11, 1939 at Stuie, alt. 5700 feet. The two males are in somewhat worn plumage; the female is very worn, moulting, and with a brood patch evident; their wings measure, male 71.72, female 69 mm. The two males in size, slender bill and brownish upperparts agree well with specimens from Chitina River and McCarthy, Alaska, differing only in having slightly smaller bills and slightly more black in the crown. The female is somewhat greyer, but is best referred to this form. This appears to be the most southwesterly reported breeding station for *anthinus* (in the restricted sense as used by Peters and Griscom, 1938, *Bull. Mus. Comp. Zool.*, 80, pp. 445-477)

Passerella iliaca altivagans Riley

ALBERTA FOX SPARROW

No summering fox sparrows were found in the Horseshoe Lake to Kingcome Inlet area

in 1936, nor in the Rivers Inlet area in 1937. In the Bella Coola area in 1938 it was found first on July 30, when an immature bird was taken and another seen on Aug. 2 at Stuie. It was next encountered, Aug. 7, on the Caribou Mountains at 4700 feet altitude, when a female and an immature were taken, and another immature the next day. On Aug. 11 a few more were seen. By Sept. 2, 1938, fox sparrows were present in the heavy sparrow migration, then passing.

The Aug. 7 female is still in nestling plumage; of the other two females from 4700 feet in the Caribou Mountains, one is in worn summer plumage, the other is moulting into first winter plumage. Both compare well with specimens of *altivagans* from McGillivray Cr  ek. Another, referable to this race, was taken on Mount Brilliant, Sept. 6, 1938.

The Stuie immature taken July 30 is only partly in first winter plumage, and though identification is uncertain, appears to be closer to this form than to either *fuliginosa* or *townsendi* that might be expected to breed here.

Rhynchophanes mccowni (Lawrence)

MCCOWN LONGSPUR

Laing took a female May 29, 1930 at Newgate. The only previous records for the province were the three birds taken by Brooks at Chilliwack in June, 1887 and June 1890. (See Brooks and Swarth, 1925, p. 90).

Calcarius ornatus (Townsend)

CHESTNUT-COLLARED LONGSPUR

A female taken May 28, 1930, at Newgate by Laing is the second record for the province. The other record was a female from the Kispiox Valley, 23 miles north of Hazelton July 8, 1921 (Brooks and Swarth, 1925, p. 90).

NOTES AND OBSERVATIONS

A KITTIWAKE GULL (*Rissa tridactyla*) banded in northwestern Iceland and recovered off Nova Scotia: A Kittiwake Gull banded "as full grown" on May 27, 1938, at Kollsvik in northwestern Iceland for or by Mr. Finnur Gudmundsson of the Bird Ringing Scheme of the Museum of Natural History at

Reykjavik, Iceland, was caught on a fishing-trawl on or about January 13, 1943, by a member of the crew of a fishing schooner operating on Lahave Bank, some distance off Lahave, which is in Lunenburg County, Nova Scotia. —T. S. HENNESSY, NATIONAL PARKS BUREAU, OTTAWA.

THE SNOWSHOE RABBIT ENQUIRY, 1940-41¹

By DENNIS CHITTY and MARY NICHOLSON
Bureau of Animal Population, Oxford, England

CANADA

DURING 1940-41, snowshoe rabbits (where their numbers fluctuate at all) were increasing in density. Greatest abundance had been reached in northern Alberta; and numbers were also high in northern British Columbia, Saskatchewan and Manitoba and in Nova Scotia. In the mountains of southern British Columbia and on the edge of the prairies rabbits remained scarce. No reports mentioned real abundance in the Northwest Territories, Ontario, Quebec or New Brunswick; and in the Yukon almost no recovery was apparent.

For the first time in several years reports of mortality were received, nearly all from Alberta and Saskatchewan. Although natural mortality is more obvious at a time of greater density, the majority of reports suggest the beginning of epidemics characteristic of the final year of a cycle of increase. Reports from the two main areas of mortality are given below:

General vicinity of Peace River Settlement, Alberta. "Rabbit carcasses were lying all over on the north side of Wapiti River". (A. L. Osborne).

"There appeared to be many deaths during the past winter due to natural causes, as many carcasses were noted in the bush in late winter and early spring. Mostly during March rabbits became slow and ticks were noticeable in many instances". (E. J. Watts).

"The wood ticks have killed a large number". (C. K. S. Keeper). Not mapped as epidemic.

"Several have been observed during December and January to have died of some epidemic. Old-timers have stated that they have never seen the rabbits so plentiful. They have destroyed thousands of tons of feed during the winter months. It is quite common for a farmer to kill 200 rabbits in one night to protect his feed. Thousands have been killed for pelts and fox food". (H. L. Walker).

"Rabbits have begun to die off this spring. During my travels lately - April and May 1941 - have seen many dead: about one a mile along bush roads". (N. F. Lee).

Lac la Biche, Alta. and Beaver River valley to Green Lake, Sask. "In the spring months of this year they seemed to go about in a humped-up position when running." (E. N. Tikkanen).

"In March the rabbits became sluggish, thin and seemed to waste away". (W. J. Callihor).

"Epidemic in March." (W. Lapenold).

"A lot of rabbits died off during the latter part of winter and early spring, and dead rabbits could be found along highways and logging roads anywhere in the area, especially during March and April." (A. C. Roline).

"Quite a number died late winter and early spring, but rabbits are still plentiful. They appeared to be running along and then rolled over and died suddenly." (J. Barnett).

"In February and March they were just lying all over dead." (G. W. Clay).

"Towards spring large numbers of dead rabbits were seen all through the bush". (F. J. Mitchell).

Two reports from Nova Scotia are as follows:

"In September and October rabbits appeared dopey and a number have been seen dead lately." (F. H. Finney, Baddeck, N.S.).

"On March 1st, 1940 there was 2900 lbs. of rabbits in Yarmouth cold storage. On March 1st 1941 there was 4700 lbs. Two young men shot 114 in 7 hrs.; another boy shot 16 without moving in 10 minutes - any number of like cases." (C. C. Rurrell)

UNITED STATES AND ALASKA

At Lake Alexander, Minnesota, Dr. R. G. Green's 1941 census showed that there had been an increase in rabbit density from 74 to 160 per square mile. Other observers in this state confirm the marked improvement after the previous year of stagnation. In Wisconsin recovery had continued; but Mr. W. E. Scott reports it as unusually slow, stating that half of the 42 warden's reports were still of *no change*. Hunters killed only 93,012 rabbits as against 110,953 the previous season, but there may have been less hunting. In the Upper Peninsula, Michigan, recovery was much more noticeable than in

1. —Received for publication January 13, 1943.

TABLE I

Reports for 1940-41 about changes in abundance of snowshoe rabbits in Canada compared with 1939-40 (each year ending 31 May).

| | No. of Observers | | | | | % of Observers | | | |
|-----------------------------|------------------|----------|-----------|-------|----------|----------------|----------|-----------|----------|
| | Increase | Decrease | No Change | Total | Epidemic | Increase | Decrease | No Change | Epidemic |
| Yukon | 3 | 3 | 3 | 9 | 0 | 33.3 | 33.3 | 33.3 | 0 |
| Northwest Territories | 27 | 1 | 1 | 29 | 0 | 93 | 3.5 | 3.5 | 0 |
| British Columbia | 29 | 6½ | 30½ | 66 | 2 | 44 | 10 | 46 | 3 |
| Alberta | 63 | 6 | 19 | 88 | 9 | 72 | 7 | 21 | 10 |
| Saskatchewan | 73 | 6 | 10 | 89 | 6 | 82 | 7 | 11 | 7 |
| Manitoba | 45 | 1 | 13 | 59 | 0 | 76 | 2 | 22 | 0 |
| Ontario | 47½ | 5 | 18½ | 71 | 0 | 67 | 7 | 26 | 0 |
| Quebec and Labrador | 38½ | 14½ | 12 | 65 | 1 | 59 | 22 | 19 | 2 |
| New Brunswick | 6 | 1 | 2 | 9 | 0 | 67 | 11 | 22 | 0 |
| Nova Scotia | 17 | 10 | 10 | 37 | 1 | 46 | 27 | 27 | 3 |
| Total | 349 | 54 | 119 | 522 | 19 | 67 | 10 | 23 | 4 |

TABLE II

Reports for 1940-41 about changes in abundance of snowshoe rabbits in U. S. A. (*L. americanus* only) compared with 1939-40 (each year ending 31 May).

| State | No. of Observers | | | |
|---------------------|------------------|----------|-----------|-------|
| | Increase | Decrease | No Change | Total |
| Maine | 1 | 0 | 2 | 3 |
| Michigan | 11 | 3 | 1 | 15 |
| Minnesota | 7 | 0 | 1 | 8 |
| New Hampshire | 0 | 1 | 0 | 1 |
| New York | 2 | 0 | 0 | 2 |
| Pennsylvania | 2 | 0 | 0 | 2 |
| Vermont | 2 | 0 | 0 | 2 |
| West Virginia | 1 | 0 | 0 | 1 |
| Wisconsin | 4 | 0 | 0 | 4 |
| Total | 30 | 4 | 4 | 38 |
| Percentage | 79 | 10.5 | 10.5 | |

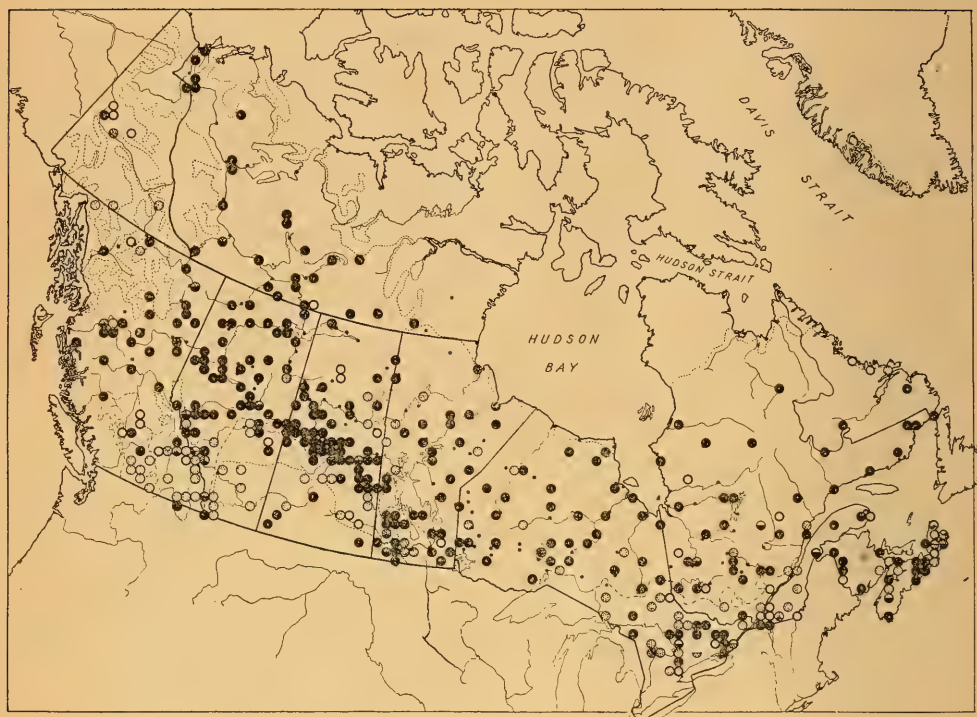


Fig. 1. Reports for 1940-41 about changes in abundance of snowshoe rabbits compared with 1939-40. Each circle of 30 miles diameter (100 miles in Alaska) marks the approximate centre of a stretch of country reported on by one or more observers. (*Canadian Field-Naturalist* 54: 117). INCREASE reports are shown black, DECREASE white, NO CHANGE stippled. Where reports at the same centre disagree the circle is divided up in proportion to the number of opinions of each kind.



Fig. 2. Reports of disease and epidemics in snowshoe rabbits during 1940-41. Each circle of 30 miles diameter marks the approximate centre of an area in which mortality was reported by one or more persons.

1939-40. Low numbers, but continued recovery were mostly reported from further east.

In Alaska, recovery was not yet obvious from a 'crash' which occurred more recently than anywhere else.

ACKNOWLEDGEMENTS

Information has been supplied for this enquiry by 141 men in the Royal Canadian Mounted Police, 151 provincial game wardens, 74 National Park wardens, 149 Hudson's Bay Company post managers and 36 others - a total of 551 observers in Canada. In the United States there were 39 observers and in Alaska four, one of whom (Mr. Frank Dufresne of the Alaska Game Commission) again supplied reports on four separate areas. We are indebted to these 594 men for continuing to supply information, often in great detail.

Responsibility for the annual collection of data is kindly undertaken by the National Parks Bureau, Ottawa, the Hudson's Bay Company, Winnipeg and the U. S. Fish and Wildlife Survey, Washington, D. C. It is very satisfactory that the long term value of the investigation has been recognised and that its continuity is being maintained. Thanks are largely due to Mr. Hoyes Lloyd in Ottawa, Mr. R. H. G. Bonnycastle of Winnipeg and Dr. H. H. T. Jackson in Washington.

Financial assistance for the work in Oxford has been supplied by the Carnegie Corporation of New York through the Carnegie

Institution of Washington, and by the Hudson's Bay Company.

SUMMARY

During 1940-41 the snowshoe rabbit, *Lepus americanus*, continued to increase throughout most of its range, the distribution of observers' reports between *increase*, *decrease* and *no change* being about the same as in 1939-40. In Alaska and the Yukon the early stages of recovery had not obviously become established; while, at the opposite phase of the cycle, rabbits had reached high numbers in parts of the north of the four western provinces and in Nova Scotia. The beginnings of epidemics were noticed locally.

The populations in southern British Columbia remained stable, reports from this area accounting for the high proportion of *no change* in the province.

In Minnesota a great improvement was obvious; but east of here, both in Canada and the U.S.A., the speed of recovery was definitely slow.

REFERENCES & ERRATA

There have been nine previous reports, covering the years 1931-40. The last paper (*The Canadian Field-Naturalist* 56: 17-21, 1942) contains the other references. In Table I of that report the total number of observers reporting *increase* and *no change* should be 311 and 114, not 331 and 50. Mr. D. W. Mather has since corrected the population estimate in the Nicolet National Forest, Wisconsin, from 82 to 86 per square mile for March 1940.

BOOK REVIEW

SOME RECENT BIRD RECORDS FROM CANADA'S EASTERN ARCTIC. By T. M. Shortt and H. S. Peters, 1942, *Can. Journ. Research*, 20, Sect. D, pp. 338-348, with sketch map.

This is a list of birds seen by Shortt in 1938 and Peters in 1939 while on the Arctic Cruise of the R. M. S. Nascopie, and contained in four small collections, one made by Shortt in 1938; one made by L. A. Learmonth at Somerset Island 1938-40; one at Lake Harbour, Baffin Island, by Rev. C. L. W. Bailey 1930-32; and one at Eskimo Point, N.W.T., by Rev D. B. Marsh.

Some 83 birds are listed, with some breeding notes, a few critical comments, but

mostly locality records. Only species headings are used. It would have been better, where subspecific identifications have been made, as in the Eider Duck, Canada Goose, and Herring Gull, to use the appropriate subspecies headings.

Some of the more interesting records are of additional Yellow-billed Loons (Somerset Island); a stray American Coot at Bellot Strait; a Mountain Bluebird at Churchill; Wheaters not uncommon at a number of localities; and several White-crowned Sparrows at Lake Harbour.

The sketch map is a useful feature and one that should be supplied with every faunal report. —A. L. RAND,

BIRD NOTES FROM SOUTH-WESTERN SASKATCHEWAN¹

By L. B. POTTER
Eastend, Sask.

THE FOLLOWING NOTES are the result of forty years' life on a stock ranch near Eastend in the southwestern corner of Saskatchewan, and observation of the birds during that period. The writer came out from England as a boy, knowing nothing of "sight records" or the importance of collecting specimens to verify such records. Certain species mentioned are, therefore, open to doubt; but the writer considers they should nevertheless be included, for what they are worth, with the hope that in days to come the records may be substantiated. Subspecific nomenclature has been avoided owing to uncertainty in several cases.

Pandion haliaetus OSPREY

Not common but possibly may nest at the headwaters of the Frenchman River. On June 9, 1931, the writer watched an Osprey catch a large fish close by his house. Also seen October 6, 1940, and September 5, 1941.

Centrocercus urophasianus SAGE HEN

In early days the Sage Grouse was a familiar object along this valley, and there was a "dancing ground" in our field. As the country settled up about 1908-1915, this grand bird seemed fated to pass out along with the prong-horn antelope. However much land has reverted to pasture with the result that the Sage Grouse is making a successful "come-back" and under existing conditions appears likely to hold its own in fair numbers.

Sterna forsteri FORSTER'S TERN

Apparently rare. Five of these terns were seen by the writer at Cypress Lake, 25 miles to the west on June 25, 1933. They were easily distinguishable from *S. hirundo* by their call-notes.

Coccyzus erythrophthalmus BLACK-BILLED CUCKOO

This Cuckoo was not noted here until July 3, 1912, when a single bird was observed. The species was not seen again until July 13, 1917, but 1923 witnessed a large visitation of cuckoos. One female bird with an egg in the oviduct, and killed by a cat was shown

to the writer. Very numerous again in 1940 and in fair numbers each summer since then.

Otus asio SCREECH OWL

Seen only once by the writer during the winter of 1903-04; while clearing some willow scrub, he surprised the bird at close quarters. The Screech Owl remained on the "hypothetical list" for several years after this and apparently occurs only sparingly in the southern part of the province.

Antrostomus vociferus WHIP-POOR-WILL

Rare, but apparently migrates through this section from the north, a specimen having been taken near Prince Albert. A Whip-poor-will was seen (not heard as stated in Bent's Life Histories, *Bulletin* 176, *U.S. Nat. Mus.*, 1940, p. 183) by the writer and a companion on August 29, 1919. When first noticed by us, as we sat in a wagon, the bird was squatting on the ground in some willow brush; when flushed it rose with a flopping flight which, together with the absence of white wing masks, proclaimed it a Whip-poor-will, and not the familiar Night-hawk. Another Whip-poor-will was seen by the same observers on September 2, 1921, as it flushed from a fence post just after dusk.

Antrostomus nuttalli POOR-WILL

A Poor-will was heard by the writer for two or three nights in June 1905, at this ranch.

Selasphorus rufus RUFOUS HUMMINGBIRD

A hummingbird was picked up dead in Eastend on August 11, 1929, and given to the writer. Sent to the Provincial Museum at Regina this was identified as a Rufous. There are two other records from this neighbourhood.

Stellula calliope CALLIOPE HUMMINGBIRD

A Calliope Hummingbird was shot (not found dead, as stated in Bent's Life Histories: *Bulletin* 176 *U. S. Nat. Mus.*, 1940, p. 429) in a garden at Shaunavon, twenty-five miles east of Eastend, on August 22, 1935.

This is the first and only record for the province. Hummingbirds are seen not infrequently in flower gardens, but public opinion in general is opposed to shooting, so their identity, whether rufous, calliope, or ruby-throated, remains undetermined.

1. —Received for publication March 9, 1943.

Asyndesmus lewis LEWIS'S WOODPECKER

An uncommon straggler from the West. The species was first observed at this ranch on September 19, 1915, and there are several other fall records, all in the same month. Of late this woodpecker has been seen by the writer twice in early summer (May 12, 1938, and May 26, 1939) and there are reports of others at about the same date. All these May records are for solitary individuals, and the species has not as yet been discovered breeding in Saskatchewan.

Myiarchus crinitus CRESTED FLY CATCHER

On May 24, 1933, this Fly Catcher was observed by Mr. Spencer Pearse and the writer. It was shy, and kept moving along the tree tops. This is an extreme western point for the Crested Fly Catcher.

Cyanocitta cristata BLUE JAY

The Blue Jay is practically unknown in the Cypress Hills. On December 31, 1916, a jay of this species was seen by the writer and F. D. Corry, at the latter's ranch near Ravenscrag, in the Frenchman River valley. A few other Blue Jays were seen during the same winter, and these appear to be the only recorded appearances here.

Pica pica MAGPIE

The Magpie is such a familiar feature of our landscape today - we may depend on seeing one or more, usually more, any and every day of the year - that it is hard to realize the species was entirely absent for about five years. When the writer first came here in 1901, until about 1904, the Magpie was common enough. From that time none were seen until the fall of 1910, two birds appearing here on September 4th. Since then the Magpie has not only fully re-established itself, but has extended its former range considerably. This strange disappearance has been generally attributed to the extensive practice of setting out poisoned bait for timber wolves, which were a serious scourge to stockmen about that time. This seems a scarcely adequate reason; the country was then only sparsely populated and the Magpie is a highly intelligent bird, none too easily poisoned, as anybody who has tried, knows.

Corvus corax RAVEN

The Raven was occasionally seen here in early days, but is unknown now. The writer's last record is January 12, 1916.

Nucifraga columbiana CLARK'S NUTCRACKER

A Nutcracker was collected by Mr. Spencer Pearse at his ranch 12 miles west of East-end, on September 17, 1919. The specimen is

now in the Provincial Museum. Mr. Pearse saw another Nutcracker in September, 1925.

Cyanocephalus cyanocephalus PINYON JAY

A Pinyon Jay appeared at this ranch on September 16, 1910. The species is not included in the Canadian list. However, the writer was able to watch this bird walking about in the yard for a minute or two, and examine it carefully with a field-glass. There was no opportunity to secure the bird before it flew away. There is little likelihood of another such record occurring here, although the Pinyon Jay is said to be a great wanderer, and its appearance in this extreme corner of the province is hardly more surprising than that of the Nutcracker.

Cinclus mexicanus AMERICAN DIPPER

A dipper in Saskatchewan sounds improbable, but there are on the southern slopes of the Cypress Hills several streams, swift-flowing and with gravelly beds that are well suited to this particular bird. No specimens have been secured, but there have been several reports of the Dipper, nearly always in the coldest winter weather, by persons familiar with the bird in the mountains. There is no doubt that the Dipper will be taken eventually in this part of Canada.

Mimus polyglottos MOCKINGBIRD

The Mockingbird was first recorded in this province by Mr. Steve A. Mann, at his farm south of Piapot on May 2, 1927. On June 4, 1928, a male bird was collected at this ranch by the writer. Subsequently mockingbirds nested at various points in Saskatchewan, also in Alberta. The last Saskatchewan record of which the writer is aware was 1937.

Oreoscoptes montanus SAGE THRASHER

The first Sage Thrasher to be taken in Saskatchewan was secured by Mr. Chas. F. Holmes, on June 24, 1933, in the Frenchman River valley south of Shaunavon. The following year a nest containing five eggs was found at this ranch on June 12, by Mr. Fred Bard of the Provincial Museum. Three other nests were found here during the month. During recent years records of the Sage Thrasher have decreased, and it remains to be seen whether this new comer is to become a permanent addition to our bird list, or disappear, as the Mockingbird seems to have done.

Sialia sialis EASTERN BLUEBIRD

The Eastern Bluebird was first seen by the writer on July 16, 1922. This was a male bird, one of a pair that had nested in a telegraph pole in the railway line crossing this ranch.

During the past twenty years there have been several further records, but the species is still an irregular and uncommon visitant. Although this point is less than fifty miles east of the Alberta boundary, there appears to be no record of the Eastern Bluebird in that province.

Myadestes townsendi TOWNSEND'S SOLITAIRE

The writer's first meeting with the Solitaire occurred on April 19, 1908, about fourteen years before the first specimen was taken in the province. There are a few further records since, including one at this ranch on April 24, 1941. The Solitaire is unobtrusive, both in habits and appearance, and bird watchers are few and far between; otherwise the bird might be reported more frequently than hitherto.

Dendroica caerulescens BLACK-THROATED
BLUE WARBLER.

A male of this rare warbler was observed by the writer on September 21, 1937. A specimen, now in the Provincial Museum was secured near Percival, 100 miles east of Regina, on October 21, 1936.

Icteria virens YELLOW-BREASTED CHAT

The Chat, a new comer twenty years ago, has since established himself as a fairly common summer visitant. A few nests have been found in this locality, one of them on July 3, 1937, containing two young birds and two eggs. It may be worth noting that no Chats have been seen or heard during the summer of 1942.

Icterus bullocki BULLOCK'S ORIOLE

A fine male Bullock's Oriole was noted here for the first time on May 26, 1937. Later, on July 1st, a pair of these orioles, the male in immature plumage, were found nesting nearby. Other records are June 14-18, 1938; June 20, 1939 and June 3, 1941.

Passerina amoena LAZULI BUNTING

There are several records of this western species. The writer saw a single male bird at this ranch on June 1st and 2nd, 1908. A number of pairs were seen in this district during the summer of 1940. A nest was found in Shaunavon in a rose bush and contained five eggs, and two more pairs were seen.

Spiza americana DICKCISSEL

In the early hours of June 16, 1940, the writer awoke to the sound of unfamiliar bird notes which on investigation proved to be the "song" of the Dickcissel. This bird remained within a hundred yards of the house until July 2nd. Its general appearance and monotonous ditty reminded one somewhat of the Yellowhammer of Britain.

Hesperiphona vespertina EVENING GROSBEEK

A favourite food of this Grosbeak is the seed of the Manitoba maple, and the extensive planting of that tree on the prairies has attracted these birds to places where they would otherwise never appear. The writer saw his first Evening Grosbeaks on January 4, 1929, or nearly thirty years after coming to this district. Since that date Grosbeaks have appeared on several occasions.

Lencosticte tephrocotis ROSY FINCH

Rosy Finches are irregular winter visitants, sometimes appearing in large flocks, or again entirely absent for several seasons. The Grey-crowned Rosy Finch (*L. t. tephrocotis*) is the more usual, but Hepburn's (*L. t. littoralis*) also occurs.

Hedymeles ludovicianus ROSE-BREASTED
GROSBEEK

Hedymeles melanocephalus BLACK-HEADED
GROSBEEK

Both these species are uncommon in this locality. A Rose-breasted was seen by the writer on May 15, 1911, and another was reported in Eastend on June 5, 1924. A Black-headed Grosbeak was collected at this ranch by H. H. Mitchell, on May 27, 1917, and another was seen on July 25, 1926. There is no evidence of either species nesting here.

Pipilo maculatus SPOTTED TOWHEE

Over the greater portion of Saskatchewan this bird is uncommon or absent. In the Cypress Hills it is one of our most familiar summer residents, and a pair may be found in almost any area of bush, large or small. The male bird is easy to spot, frequently noticed singing from a top-most twig; but the female is one of our shyest birds and rarely shows herself.

Chondestes grammacus LARK SPARROW

The Lark Sparrow is a striking example of a bird formerly uncommon, that has increased with the settlement of the prairies. The writer can recollect the species at one time as an irregular spring visitant, appearing occasionally about mid-May and disappearing after a few days. Sometimes one or more years would pass without the bird being seen. On June 6, 1922, the writer secured a singing male in full breeding condition; this was the first indication of the Lark Sparrow nesting in the vicinity, and incidentally the first specimen taken in Saskatchewan.

Of late years this sparrow has increased perceptibly and has extended its range. The

first recorded nest was found at Regina in 1934. The writer discovered a nest containing five eggs on June 17, 1940, and the species is now one of our regular breeding birds.

Passerella iliaca FOX SPARROW

The writer has seen a Fox Sparrow once

only, on Sept. 29, 1941. Another was reported seen during a severe snow storm on September 22, 1934. This sparrow is said to be a very fleeting migrant, and this point is probably not within the regular limits of its migration route.

BOOK REVIEW

THE BIRDS OF BRITAIN by James Fisher, 80v; 48 pp., 12 color plates, 26 black and white illustr., 1942. London and Glasgow: William Collins Sons and Co. Ltd. Price 3s. 6d.

This is one of the Britain in Pictures series, of which some thirty volumes have appeared. One of the striking things about this book is that it was produced in Great Britain in the war year of 1942. The reason appears toward the end of the volume where the author says that the section of the British public with a recreational interest in birds is large, possibly numbering over a million people, and is increasing, and he asks "Who shall stop the British at their honest play?"

This is a background study, a summary of the country, its birds, their students and the present, past and future of both birds and students. An interesting feature is that estimates of the numbers of individuals of some species are given. On Britain's 57 million acres each year some 120 million land birds nest. Of the 424 species of birds recorded in Britain about 200 are "perhaps the most written of, the most poeticised, the most sung of, dreamed of, listened to, observed, protected, loved, birds in the world". Moors and heath may have a population of one bird to two acres; gardens as many as ten to the acre. The small fields, with their hedgerows help support a large bird population.

The bird life is contrasted with that of the continent; migration and banding is touched on. In 1890, in order to study movements of woodcock, young were banded in Northumberland.

The history of the birds, with their habits, marching northward across Britain following the retreating ice, is sketched since the ice age 15,000 years ago, through a pine wood age, and an oak wood age, to the present agricultural age. Relics of an earlier, more northern fauna, such as Ptarmigan and

Snow Buntings, persist as relics. The present day agriculture age birds are drawn largely from the oak woods. The Chaffinch and the Blackbird are the most abundant land birds, numbering about ten million each in England and Wales. Probably all of Britain has been changed by man and over half of it is now tilled. Water and marsh species have suffered particularly in this change. Introduction of firearms caused a decrease in birds of prey, and game management an increase in game birds. Collectors have helped to decimate some of the rare species and protection has saved some from disappearing. Changes are occurring independently of man; as the increase of the Fulmar and Gannet, and the invasion of the Black Redstart.

Turner wrote the first original and scientific treatise in 1544 and through a long line of outstanding names such as Ray, Willoughby, White, Pennant, Yarrow and Newton, the work has culminated in the present magnificent Handbook of British Birds that is perhaps the best local work extant.

The growth of public interest in natural history has increased since the last war, and is increasing during this.

The academic phase of description and enumeration being completed, Fisher believes the future will have much organized birdwatching, with national centres for correlating results and that the country natural history societies will be revived.

The illustrations, ranging in date from 1652, by such artists as Gould, Wolf, Lodge, Thorburn, Millais, Audubon, Albin, Donovan, Keulemans and Neale are very attractive and make us realize how good were some of the earlier bird plates.

The book ends with an enumeration of birds recorded up to 1941, classified into lists according to their type of occurrence.

It is a pleasing, interesting summary and to be recommended as a survey of bird life in Britain for the general reader. A. L. RAND.

TOWNSEND VOLE (*Microtus townsendi*) IN CANADA¹

By R. M. ANDERSON and A. L. RAND

National Museum of Canada

THIS SPECIES has a restricted range in south-west British Columbia and western Washington and Oregon to California west of the Cascades.

Bailey (1900, *North American Fauna* No. 17, p. 46) considered it a species with no close affinities except *tetramerus* of Vancouver Island. Of the other members of the genus he considered it nearest to the *longicaudus* and *mordax* group (now all included in *longicaudus*, see Goldman, 1938, *Jour. Mammal.*, 19, pp. 491-492). Bailey (*l.c.*) considered *tetramerus* of south Vancouver Island a separate species though his discussion showed its characters to be only relative, and it is now considered a subspecies. Our material confirms this.

Hall, (1936, *Murrelet*, 17: p.15) described an additional race *cummingi* from Bowen Island to which it is restricted and Dalquest (1940, *Murrelet*, 21, p. 7) described another race *pugeti* from Shaw Island, with a range over San Juan, Shaw and Cypress Islands in northern Puget Sound, Washington. In the present paper an additional race is described from north Vancouver Island.

Swarth, (1933, *Proc. Biol. Soc., Wash.*, 46, p. 210) suggests that there is a close relationship between *Microtus longicaudus macrurus* of Lund and Rivers Inlet, B.C., and *tetramerus* of Vancouver Island. This might indicate that *townsendi* could be included with the forms now placed in the species *longicaudus* by Goldman (*l.c.*).

However the morphological evidence does not support this view; *macrurus* from Rivers Inlet, of which we have a good series, does not show any approach to the Vancouver Island forms. Also *townsendi* and some forms of *longicaudus* occur in the same spots as *abditus* and *townsendi* - (A. B. Howell, 1923, *Jour. Mammal.*, 4, p. 36).

In the area inhabited in Canada by this species, the only other member of the genus that occurs is *oregoni*, on the mainland; *townsendi* is the only species occurring on Vancouver Island.

In Canada *townsendi* is distinguishable from *macrurus* and *mordax* by the shorter tail; well developed hip glands; long, narrow incisive foramina; flatter, more angular bullae; and the tendency toward an interior point on the second upper molar. The number of plantar tubercles and their importance seems to be in question (Howell *op. cit.*, p. 33).

The forms that occur in Canada are,-

Microtus townsendi townsendi (Bachman)

Microtus townsendi tetramerus (Rhoads)

Microtus townsendi laingi new subspecies.

Microtus townsendi cummingi Hall

We are indebted to the Provincial Museum of British Columbia, through the kindness of the Director, Dr. G. Clifford Carl, for the loan of topotypical material of *M. t. tetramerus* used in this study.

***Microtus townsendi townsendi* (Bachman)**

Arvicola townsendi Bachman, 1839, *Jour. Acad. Nat. Sci. Phila.*, VIII, p.60.— Lower Columbia River, near mouth of Willamette, on or near Wappatoo (or Sauvie) Island.

We have a large series of this form from Huntingdon; adult males measure: total length (7) 190-203 (av. 194.5 mm.); tail (7) 49-63 (av. 57.4); hind foot (7) 24-26 (av. 24.8); skull, basal length (10) 26.5-31 (av. 28.6); zygomatic breadth (10) 15.5-18 (av. 17.1).

Range.— Extends into Canada only to Port Moody, Huntingdon and Chilliwack in extreme southwestern British Columbia, south of the lower Fraser River. No form of *longicaudus* appears to occur there.

***Microtus townsendi tetramerus* (Rhoads)**

Arvicola (Tetrameron) tetramerus Rhoads, 1894, *Proc. Acad. Nat. Sci., Phila.*, p. 283 - Beacon Hill Park, Victoria, British Columbia.

Diagnosis - Smaller than *townsendi*, with skull flatter, or even concave in profile in the inter-orbital area; with proportionally wider inter-orbital; and with the posterior end of the nasals rounded or pointed, not truncate.

Measurements. - (1 adult female, Albert Head, Victoria) total length 170 mm.; tail 48; hind foot 20; skull (males, vicinity of Victoria) basal length 25.5, 25.75, 25.75, 26.25, 26.25; zygomatic breadth 15, 15.5, 15.75, 16, 16. Bailey, (*l.c.*) gives the following measurements average of 6 adult males from Goldstream, near Victoria: 177; 54.3; 22; and one skull of

1. —Received for publication April 5, 1943.

an adult male as basal length 27.3 and zygomatic breadth 16. Rhoads gives the average of five adults as 175; 48; 22; 26.5; 15.

Range. - Known only from the vicinity of Victoria, southern Vancouver Island.

Remarks. - It might be argued that the smaller size of *tetramerus* is due to only small individuals being collected, but Rhoads (*l.c.*) had ten specimens from Beacon Hill Park; Bailey (*l.c.*) had seventeen from Goldstream and near Victoria, near the type locality, and we have seen an additional fifteen, all of which support the original description as to the small size of *tetramerus*.

The restricted range of this form may perhaps be correlated with the distribution of the Madrona-Oak Transition section of Coast Forest, that on Vancouver Island is restricted to the southeastern part (Halliday, 1937, *Forest Service Bull.* 89, Ottawa, p. 26).

Microtus townsendi laingi new subspecies.

Type No. 13423, National Museum of Canada, ♂ ad., Port Hardy, North Vancouver Island, July 23, 1935, H. M. Laing.

Diagnosis. - Closest to *tetramerus* from which it differs in its larger size and in its slightly paler brownish coloration.

Measurements. - Adult males (from various localities from Upper Campbell Lake to Cape Scott, Vancouver Island), total length, (10) 194-225 (av. 207 mm.); tail (10) 53-70 (av. 63.8); hind foot, (10) 23.5-26 (av. 24.5); skull, basal length (9) 27-31.5 (av. 28.75); zygomatic breadth (9) 16.5-18.5 (av. 17.14).

Range. - The northern part of Vancouver Island, south to Beaver Creek west of Port Alberni.

Remarks. - Previously no *Microtus* was known from the northern portion of Vancouver Island. Swarth (1912, *Univ. of California, Pub. in Zool.*, 10, p. 96) lists the measurements of ten adults (males and females) from Beaver Creek as length 185-205 (av. 193.2 mm.); tail 59-64 (av. 62.7); hind foot 24-25 (av. 24.4) and these measurements place them with the present form.

We have seen no specimens of *pugeti* but from the description (Dalquest *l.c.*) it is closest to *cummingi*, differing from that form in having a longer body, shorter tail, shorter hind foot, (average 8 adults: t.l. 182.6; t. 50.3; h.f. 23.2). Six specimens from Hurst Island are all immature and consequently not determinable. Their hind foot is relatively large; they average 142.3; 46.5; 22.4.

Microtus townsendi cummingi Hall

Microtus townsendi cummingi Hall, 1936, *Murrelet*, 17, p. 15. Bowen Island, Howe Sound, British Columbia.

Diagnosis. - Color like *townsendi* and *tetramerus*; rostrum of skull actually and relatively wider than in *townsendi* or *tetramerus*, dorsal outline of skull convex in inter-orbital region, rather than concave as in *tetramerus*, and more convex than in *townsendi*; zygomatic breadth greater even than in *townsendi*; mastoid region relatively wide as in *townsendi*, and actually wider than in that race; nasals wide anteriorly as in *tetramerus* (from original description).

Measurements. - Of five adult males, total length 169-181 (av. 176 mm.); tail 50-59 (av. 55); hind foot 24-25.5 (av. 25.0); basal length of skull, including incisors 27.3-29.2 (av. 28.4); zygomatic breadth 16.2-17.6 (av. 16.9) (from original description).

Range. - Restricted to type locality.

Remarks. - We have seen no specimens of this race, but the convex profile of the inter-orbital region should be diagnostic.

Material Examined

(Specimens in the National Museum of Canada unless otherwise indicated.)

M. t. townsendi; Huntingdon, 42 specimens.

M. t. tetramerus; Victoria, 3; Uplands, Victoria, 7¹; Beacon Hill Park, Victoria, 1¹ Albert Head, 2¹; Metchosin, 2¹; Total 15 specimens.

M. t. laingi; Upper Campbell Lake, 5; Sayward, 8; Port Hardy, 2; Shushartie, 6; Cape Scott, 3; Hurst Island, 6¹; Total 30 specimens.

1. -British Columbia Provincial Museum of Natural History, Victoria.

PHENOLOGY¹

THE MOST NATURAL OF SCIENCES

By R. GLENDENNING

Dominion Entomological Laboratory, Agassiz, B. C.

PHENOLOGY is described as "the study of the times of recurring natural phenomena", but phenological records seldom appear in literature in Canada, probably because observers do not publish their findings; but this unwritten science is vividly alive amongst farmers, gardeners, Indians and nature lovers whose work or interests are outdoors.

The writer has for some thirty-four years kept records of seasonal occurrences in British Columbia, and thereby has gathered some facts on recording which may be of interest and value, as before any profitable study can be made in this science suitable phenomena must be selected and properly recorded. These are presented with the hope that an organization or at least some co-operation between observers in Canada may come about.

TYPE OF INCIDENTS RECORDED

In such an immense country as Canada with its widely divergent climates, and consequently differing faunas and floras, the list of suitable items for observation will of necessity, vary widely in each province, and often within the same province. This is very noticeable in British Columbia where records of plant or bird life made in the coastal area will often have no corresponding record from the dry Interior, where fauna and flora are so different.

This does not imply that only those phenomena which occur generally throughout several zones should be recorded, but merely that these more localized incidents cannot be used for comparison except within the zones to which they are common. Here they are of value none the less.

Seasonal incidents in both plant and animal life are used in this study. Plant records usually consist of dates of first leafing, flowering, or appearance of autumnal colour. Native plants are most frequently used, chiefly on account of their general availability, but commonly grown garden plants are also helpful, and have the advantage of easy and continuous observation. Annual garden plants are not reliable as time of sowing influences their later development too much.

The time of arrival and departure of migrant birds provides good records of seasonal activity amongst animals, and the first songs of resident species are also useful.

Insects are used to a lesser extent possibly due to their irregular appearance and frequent fluctuation in numbers. However the earliest flight of the honey bee is a staple record, and the first appearance of the cabbage white butterfly is another insect record which is general and which seldom fails to appear sooner or later, generally sooner in the opinion of gardeners.

The croaking of frogs and the appearance of toads, lizards and snakes give further data.

It is impossible to formulate a complete list of items suitable for observers throughout the Dominion, but the following could be mentioned as a basis to compare seasonal conditions as they occur across Canada: dandelion flowers, appearance of bracken fern, snowdrop, yellow crocus, English hawthorn, purple lilac, and various fruit trees in flower, cocksfoot (orchard grass) in spike, nasturtiums killed by frost, the arrival and departure of the robin, barn-swallow, gold-finch, cliff-swallow and night-(or gnat) hawk.

Comparatively few trees or shrubs are indigenous to the entire Dominion, the bearberry *Arctostaphylos uva-ursi* (L.), Spreng, swamp dogwood *Cornus stolonifera* Michx., common juniper *Juniperus communis* L., aspen *Populus tremuloides* Michx., snowberry *Symphoricarpos racemosus* Michx., poison ivy *Rhus toxicodendron* L., two species of willows *Salix* sp., and the high bush cranberry *Viburnum opulus* L., are a few of those that are generally distributed, and though "splitters" amongst botanists may separate some of these into more than one species they are sufficiently related to be considered one species for phenological purposes in most cases. There are probably other items of country wide distribution, and cultivated trees, shrubs and plants would provide many more records of general incidence.

The following is a list of items from the author's record book which have been found reliable, easy and distinctive to observe in the coastal area of British Columbia. It may be

1. —Received for publication January 18, 1943.

of help to others in selecting items to record.

January

Pussy willows showing.

Wild hazel catkins open. Yellow crocus through ground. First snowdrop out.

February

Willow catkins in flower. Yellow crocus in flower. Robins returned. Red-wing blackbird singing. Bleeding heart leaves up.

March

Frogs croaking. Trillium; Salmon berry, Indian cherry, Flowering currant, Purple leaved plum - in flower. Violet-green swallow, Western evening grosbeaks returned.

April

Yellow violet, dandelion, European plums, pears, apples and lilacs in flower. Cabbage white butterfly first seen on wing. Grasshopper sparrow, Nuttall sparrow, hummingbirds returned. Morels up, and lawn first mown.

May

Cliff swallow, barn swallow, wood thrush, fly catcher, goldfinch, kingbird, returned. Swallow tail butterfly and dragonfly seen. Fall webworm moths flying. Wild roses, thimble berry, red clover, June berry in flower and cocksfoot in spike.

June

Mock orange, ocean spray in flower. Night-hawks, swifts and waxwings first seen. Frogs stopped croaking.

July

Clatter-jack heard.

August

Swallow species flocking and last seen.

September

Robins in flocks. First snow seen on Mount Cheam. Crickets heard.

October

Broad leafed maple turning colour, also garden sumach and black walnut. Spanish iris through ground. Geese going north. Grosbeaks in flocks. Seagulls returned to fields.

November

Trees (birches, maples, alders) bare. First killing frost.

December

Jasmine in flower.

Narcissus leaves showing.

POINTS IN SELECTING ITEMS FOR RECORD

Plants selected should be generally grown kinds or those frequent on nearby wild land or roadsides, and where they are most unlikely to be destroyed for many years. Individual plants of one kind only should be used for the record each year, as considerable variation may occur in different individuals even of the same species in the same location.

Field plants such as dandelion and orchard grass should be recorded from the same field or roadside each year. Frogs croaking should be recorded from the same swamp, but in none of these examples is it necessary that the earliest, or the latest, locations be selected; their usefulness lying in their comparative value in the records from year to year.

In the case of birds it is best to confine records chiefly to abundant species that can be relied upon to be present each year such as the various species of swallows and humming-birds, robins, bluebirds, etc. Rarer birds may of course be noted but with these the record will be less continuous and of less comparable value. But in a new country like Canada their notation is likely to have value in the future in showing increase or decrease, or a change of habitat due to man's presence.

METHOD OF TABULATING RECORDS

There are two methods of writing down records, and for each a well bound book with long closely ruled pages will be needed. Additional vertical lines can be ruled in as required.

Records may be tabulated month by month allowing one page for each month's items. The day of the month of each happening is inserted opposite the name of the item and under the year of occurrence. With this method it will be found occasionally that an item may not always occur in the same month each year, which necessitates a special notation and may lead to error.

The Phenological Record published by the Royal Meteorological Society in the British Isles consists of vertical columns headed by the name of the item; the year being written in the left hand column, and instead of the month and day being recorded, the day of the year is used. Thus January records consist of days 1 to 31, February of days 32 to 59, March of days 60 to 90 and so on until November 30, day 334 is reached. December days are recorded as minus figures, December

31st being minus 1, and December 1st as minus 31.

This method of notation has the advantage of greater ease in calculating averages, and in comparisons generally where the numbers are used in mathematics. It also conserves space in the record book.

VALUE OF PHENOLOGICAL DATA

The recording of seasonal occurrences has been criticised by some as an interesting hobby, but of no scientific value. This may be partly true if nothing is done with the records beyond personal comparison year by year. But phenology when properly organized goes much further than this, and when the data from hundreds of observers are sifted, tabulated and averaged some striking facts relative to climate, wild life and cycles are often revealed.

The British records as analysed by the Committee of the Royal Meteorological Society have shown that a series of cycles with an average length of 12.1 years has occurred since 1746 in England. These cycles may or may not be important in themselves, but must give added interest to the question of wild life population increases and sunspot cycles, and their relationship if any.

In order to eliminate irregularities due to local conditions in any one year the British society group the records of several species of plants together and average them, the mean of these records providing a reliable indication of an early or late season and usually tie in very closely with the season's temperature records. It is interesting to note that when thus treated these phenological data show cyclic variations more readily than do regular records of temperature, and it would appear that the last word has by no means been spoken on this debatable subject of cycles.

To obtain sufficient data to be worth while a large number of observations and records are of course needed. In the British Isles over three hundred observers send in each year their records to the Society. These all refer to one life zone practically, and are only possible in a small densely populated country like the British Isles. Before the present war a start had been made to co-operate with the rest of Europe, and ten countries were exchanging information on items common to their fauna and flora.

In addition to the more or less academic values outlined above, the recording of phenological data has several very practical uses.

For instance the annual appearance of some insects of economic importance can be timed by their co-relation with such data as the leafing or flowering of certain plants. This allows time for control recommendations to be made, or will date these recommendations exactly when the insect is obscure. The writer has found these data to be reliable and of much use in economic entomology. There is also no doubt, that other agricultural and horticultural operations such as optimum time of seeding, or harvesting of certain crops, the flowering period of plants that cause hay fever, and the proper time for cutting noxious weeds, can be dated far more reliably by phenological records than by a mere calendar date, while basically the life history of any plant is incomplete without comprehensive phenological data as to its growth, but much more work still needs to be done along all these lines of study.

HISTORICAL

The recording of seasonal occurrences is doubtless quite old, but it is only in recent years that any attempt has been made to codify them systematically so that they would be of scientific value.

The Royal Meteorological Society now has a uniform set of records that go back some fifty years. In 1926 this Society received a windfall in the accidental discovery of what are known as the Marsham Records which carried many of these observations back another 190 years. These Marsham Records have been kept with but few gaps since 1736 to the present time, and are the work of five generations of one family. The originator Robert Marsham was incidentally a contemporary naturalist and also correspondent of the immortal Gilbert White, though White's letters to Marsham are not included in most editions of "Selborne". These records were made close to Norwich in Norfolk, and cover many items now included in the Society's list.

White also of course kept account of seasonal occurrences especially in his "Naturalist's Journal" and "Garden Kalendar", but these records have not lent themselves to comparison with present day observations as have those of the Marsham family.

Besides these diaries other old records are known, items from which have been used by the Society to bridge gaps and add additional data to the record; they were kept mostly in the early 19th century but cover in each case only one generation.

One salient fact which has come to light from late study of these old records now giving a reliable picture for over 200 years, is that swallows (*Hirundo rustica*) now arrive in England eight days later on the average than circa 1750, a change that is not in agreement with climatic or plant records. What an opportunity for theorists; who should remember however that "the saddest thing - is a beautiful theory disproven by facts".

An interesting point to remember by any who may have the opportunity to peruse such old records is that all dates prior to September 2nd, 1752 are eleven days behind such dates in the present calendar; for it was not until this time that England adopted the new Gregorian calendar.

For those who may consider that there are sterner tasks to occupy our minds at the present than merely noting the returning robin I would like to finish with a quotation from that master of descriptive prose Reginald Farrer, who, referring to his collecting travels on the remote Chinese-Thibetan border during the last war, comforts us as follows:-

"For after all, the guns may roar for their time, and lay a world in ruins round us; but now the irises are blooming again at the Halls of Heaven. And when the guns are broken and silent once more, the irises will still go on blooming year by year. But the Halls of Heaven are a long way hence!"¹

1. —From the preface to the "Rainbow Bridge" dated May 19, 1918. The "Halls of Heaven" being a literal translation of the name of a large monastery in Northern Kansu, China.

NOTES AND OBSERVATIONS

NESTING OF THE PHILADELPHIA VIREO NEAR WINNIPEG, MANITOBA.—Of much interest to me was the recent article by R. D. Harris, "Status of the Philadelphia Vireo at Winnipeg", *Canadian Field-Naturalist*, Vol. LVI, Nov.-Dec., 1942, page 137. It is quite evident from the data given that *Vireosylva philadelphica* is a regular and at least a fairly common spring and fall migrant in in the Winnipeg district, a fact which is further borne out by personal observations. The infrequency of records during the nesting season, however, appears to indicate that it is a somewhat scarce summer resident. In the above article the Winnipeg records given from observations by Mr. A. H. Shortt, for at least very late May and early June, 1931 and 1932, seem to me as highly suggestive of individuals on their breeding grounds. In a footnote by P. A. Taverner, it is correctly assumed that in this region the species has breeding status, as an unquestionable nesting record has now been established for southern Manitoba.

While accompanied by my son, Roland, a nest of *philadelphica* was located on June 8, 1942, during the course of waterfowl in-

vestigations on La Salle River. At noon, while lurching in the canoe as it was tied up to the bank in the shade of a wide-spreading white elm, attention was soon drawn to the regular singing of a Philadelphia Vireo in the foliage overhead. While in the act of following this bird with x8 binoculars, the nest was detected—a pensile structure suspended from near the end of a long, drooping branch of the elm approximately 18 feet above the water. The mate was then on the nest. By climbing the tree, the latter was approached to within 15 feet, when the sitting bird was flushed for positive identification. It was impossible to reach the nest itself (evidently built of grass and plant fibres) because of its location on a thin, pendant branch far out over the river. For this reason, the contents could not be seen. Both vireos and the nest were under observation for a half-hour, during most of which time the female was on the nest, while the male sang at frequent intervals in the vicinity. The scene of this discovery was about three miles upstream from Sanford, or approximately 20 miles southwest of Winnipeg.

—J. DEWEY SOPER, FORT GARRY, WINNEPEG, MANITOBA.

THE WESTERN ELEMENT IN THE JAMES BAY AVIFAUNA

By W. E. CLYDE TODD
Carnegie Museum, Pittsburgh, Pa.

AN ORNITHOLOGICAL EXCURSION to the Gulf of St. Lawrence and the Labrador coast in 1901 gave me my first experience in the north country and whetted my desire for more. In 1906 and 1907 I worked along the line of the Temiskaming and Northern Ontario Railway, then under construction, and from there east longing eyes towards James Bay. The following year saw me embarked on a strenuous 350-mile canoe trip, requiring three weeks in each direction, from the Canadian Pacific Railway to Moose Factory. On this trip I had my first glimpse of James Bay itself and skirted its southern shores for a few miles to the eastward of the mouth of the Moose River. Since then it has been my privilege to undertake no less than eight expeditions, one of them by dog-team under winter conditions, to the southern and eastern shores of James Bay. My last expedition was in 1942. On several of these trips the east coast of Hudson Bay proper was also traversed for more or less of its length. The completion of the railway to a terminus near Moose Factory has of course greatly simplified the problem of reaching the Bay and of launching expeditions thereon. Since the region is now easily accessible, it may be well to put on record at least some of the data which have been secured in past years at a great cost of time, effort, and money.

Bird life on this coast is by no means so abundant as one might expect; it is far less so than on the Canadian Labrador, for example. In the fall there are concentrations of certain species at the south end of the Bay, but in recent years these have fallen off materially. Of the sea fowl the Arctic Tern (*Sterna paradisæa*) is perhaps the most common and most generally distributed breeding species. The Mandt Guillemot (*Cepphus grylle mandti*) follows, with the Herring Gull (*Larus argentatus smithsonianus*) third. These birds, with others that nest on the offshore islands, are shot at all seasons by the natives, and their eggs are taken and used for food. Places where they can breed undisturbed are thus relatively few. Birds of prey, too, are considered fair game and are indiscriminately killed by the native hunters. Shore birds as a breeding population are also disappointingly

few, since most of the species seen in spring and fall go farther north to nest. The Passerine birds, however, are not molested to any serious extent; some of them, like the Robin (*Turdus migratorius migratorius*) and the Savanna Sparrow (*Passerculus sandwichensis oblitus*), can be found almost anywhere, but the greatest variety occurs in the vicinity of settlements. Indeed, I know of no better place in the north country for small birds in general than the island on which the Hudson's Bay Company's post of Moose Factory is situated; it is perhaps my favorite collecting-ground.

In working up the collections brought back from these several expeditions, I was early impressed by the number of birds of supposedly western affinities represented therein. Without going into any speculative explanation at this time, or even attempting to correlate the facts in the case, I should like to call attention thereto in this necessarily brief preliminary paper. Fuller details will be reserved for the final report.

The most common breeding duck on James Bay is the Black Duck (*Anas rubripes*), but the Pintail (*Dafila acuta tzitzihoo*) is also numerous, although its main breeding range lies far to the westward. I have also one definite breeding record for the Surf Scoter (*Melanitta perspicillata*) - - another western bird. The game birds are represented by the Sharp-tailed Grouse (*Pediceetes phasianellus phasianellus*), which may be considered a species of western origin, although its present range extends far to the east and to the south of James Bay. The Yellow Rail (*Coturnicops noveboracensis*), which is locally common on the southern and on the eastern shores of the Bay, may perhaps be placed in the same category.

I have summer records for both the Long-billed Curlew (*Numenius americanus occidentalis*) and the Marbled Godwit (*Limosa fedoa*) from James Bay, but their breeding has yet to be established. In the case of the Bonaparte Gull (*Larus philadelphia*), however, no question exists, since a female was shot containing an egg ready to be laid. This extends the breeding range of this species

much farther east and south than has been supposed. Coming now to the woodpeckers, we find that the Hairy Woodpecker of the region belongs to the race *Dryobates villosus septentrionalis* (as would be expected), and that the Downy Woodpecker is *Dryobates pubescens nelsoni* - a race that clearly comes in from the west. Among the Passerine birds, there are several species of unquestionable western affinities. I had at one time identified the Black-capped Chickadee of the region as *Penthestes atricapillus septentrionalis*, but it differs from that form slightly but constantly and is probably entitled to recognition as a separate race, *P. a. anamesus*. Among the warblers of western affinities is the typical form of the Orange-crowned Warbler, (*Vermivora celata celata*), the Grinnell Water-Thrush (*Seiurus noveboracensis notabilis*), and the Connecticut Warbler (*Oporornis agilis*), of which last named I have lately secured a breeding specimen. Incidentally, the presence of these birds as summer residents in this region may explain why they occur

frequently as migrants in the eastern United States.

The only certain Meadowlark record for the region is one for the Western Meadowlark (*Sturnella neglecta*). The Red-winged Blackbird is sparingly distributed along the southern shores of the Bay, and a small series of specimens lately secured has been identified as *Agelaius phoeniceus arctolegus*. Three species of Fringillidæ are clearly of western affinities. These are the Leconte Sparrow (*Passerherbulus caudacutus*), the recently described race of the Nelson Sparrow (*Ammodramus caudacutus altera*)¹, and the Dakota Song Sparrow (*Melospiza melodia juddi*). All three of these sparrows are common birds in suitable habitat along the southern shores of the Bay.

This completes the list to date, but it does not exhaust the list of possibilities, and doubtless in time other species will be added.

1. —However Peters. (1942, Ann. Carnegie Mus., 29, pp. 201-210) believes *altera* is closer to the Acadian Sharp-tailed Sparrow than to Nelson's Sparrow. —Ornith. Ed.

NOTES AND OBSERVATIONS

CONSERVATION STAMPS FOR THE PRAIRIE PROVINCES.—We have just received a set of these stamps sponsored and produced by the Science Association of the University of Alberta during the past hunting season. The set consists of five stamps, each about one and three-quarter inches by two and one-quarter inches in size, and each depicts a game bird; Canada Goose, Mallard, Ruffed Grouse, Hungarian Partridge, Ring-neck Pheasant and in its natural setting. They were drawn by Professor W. Rowan, and are reproduced in the shades of blue, green or brown most appropriate to the subject. The backs are gummed, and the idea, modified from the American Duck Stamp, was that each hunter would buy one or more to stick on his hunting licence, as a voluntary contribution to conservation. The price for the set of five is \$1.00 or twenty-five cents a stamp.

Revenue from the sale of stamps is to be used for conservation purposes, using the word in its widest sense to include investigation of wildlife problems. One of the projects on hand is investigation of the rabbit cycle that is now at its peak. The Provincial Game Department has co-operated by distributing these stamps to their regular vendors of hunting licences. Though the response of the public has been less than was hoped for, the project is to be continued next year with a new set of stamps, so that ultimately an attractive gallery of game birds, and later game animals will be available in this series. These stamps are available from the Secretary, Dr. H. E. Rawlinson, University of Alberta, Edmonton.

A special discount is offered to Natural History Societies and Game Leagues.

—A. L. RAND

THE LITTLE NORTHERN CHIPMUNK IN SOUTHERN MANITOBA¹

By STUART CRIDDLE
Aweme, Treesbank, Manitoba

THE SEVERE AND EVER CHANGING climatic conditions under which our northern animals live have brought some of them to a degree of perfection so high, that the remarkable things they do seem to be the result of reason, or something which goes far beyond that which is commonly known as instinct. Whatever it is, the little chipmunks have developed it to a much greater degree than most of our other small mammals. This is shown by their methods of gathering and storing food, in making and concealing their homes and in constructing their nests. While they are one of the most beautiful and interesting animals we have, I have found that very few people have any knowledge of their life habits. Personally I can well understand this, because even after living among them for nearly sixty years there are still many questions which I am unable to answer with full satisfaction.

In southern Manitoba we have two races of these little chipmunks, the subject of this study, *Eutamias minimus borealis* (Allen), and *Eutamias minimus jacksoni* Howell, a slightly smaller and darker race found east of Winnipeg about the rocky ridges and sunny exposures of the mixed coniferous and deciduous forests. Beyond collecting a number of specimens at different places and watching them gathering food and playing about the rocks and small piles thrown from back roads, I know little of the life habits of this latter race. However I feel sure that they are very similar to those of the little northern chipmunk.

Eutamias minimus borealis (Allen).

Type locality. Fort Liard, Mackenzie, Canada.

Geographical Distribution. Most of the wooded and semi-wooded parts of the interior of Canada and well into the adjoining States to the south. For more exact geographical information see, *North American Fauna* No. 52. Revision of the American Chipmunks, by Arthur H. Howell, 1929.

I have collected this chipmunk at the following places in Manitoba, Kelwood, Riding Mountains, Lake Thomas, Kenton, close to

the Turtle Mountains where they are common, Tiger Hills, Ninette, Belmont, Wawanessa, Brandon Hills, Treesbank, Aweme, and the Spruce Woods. Beside these places I have seen them at many others and have no doubt they are to be found in all suitable wooded districts of southern Manitoba.

Description. A brightly coloured striped rodent with rather slender body, a long narrow tail, large dark eyes, upstanding slightly pointed ears and large cheek pouches. Extremely active, not only on the ground, but also when climbing trees or running about their branches. Can be mistaken only with Jackson's chipmunk, or perhaps with the very much larger grey chipmunk *Tamias s. griseus*, which I have found is more often than not mistaken for a striped ground squirrel than for one of these little northern chipmunks.

Colour Pattern in brief. Top of head brownish grey, becoming darker as it meets the white line above the eye, the white, below a rusty line which passes through the eye to the ear, is strongly washed with rust on the cheeks. The ears are brownish above and white below. The black central stripe of the back, commences between the ears and terminates a short distance up the tail. On either side of this are grey, black, creamy white and black stripes which are separated by an indistinct line of rusty hairs and become progressively shorter as they recede from the back. The lower black stripe merges somewhat with the browns and bright rust of the flanks, which in turn blend in with the dull white of the belly. The tail is brown overlaid with grey above and the reddish brown black and pinkish-tipped hairs of the under side give it a strikingly bright appearance. There is no seasonal change in the colour of the pelage, although it does become bleached and somewhat ragged during the annual moult, which takes place in July and August.

Measurements and weights. The measurements given below are of fifteen adult males and fifteen adult females, made soon after they were killed at Aweme. I have also given the

1. —Received for publication February 19, 1943.

largest of each sex and the measurements of *jacksoni* and *griseus*, for comparison with *borealis*. All measurements are in millimetres and weights in grammes;

Eutamias minimus borealis

| | Total length | Tail vertebrae | Hind foot | Ear at back | Weight |
|---------------|--------------------|-------------------|--------------|----------------|--------|
| Male, average | 221.....100..... | 30.2..... | 15.5..... | 41.49 | |
| largest | 234.....103..... | 33.5..... | 16..... | 44.95 | |
| Female, aver. | 229.....102.7..... | 30.2..... | 15.4..... | 41.16 | |
| largest | 233.....107..... | 32..... | 16..... | 51.63 | |

Eutamias minimus jacksoni

| | Total length | Tail vertebrae | Hind foot | Ear at back | Weight |
|--------------|-----------------|-------------------|--------------|----------------|--------|
| Male | 211..... | 91..... | 31..... | 14..... | 41.72 |
| Female | 202..... | 89..... | 31..... | 16..... | 42.55 |

Tamias striatus griseus.

| | Total length | Tail vertebrae | Hind foot | Ear at back | Weight |
|--------------|-----------------|-------------------|--------------|----------------|--------|
| Male | 266..... | 118..... | 46.5..... | 13..... | 95.31 |
| Female | 274..... | 116..... | 38..... | 15.5..... | 100.75 |

Sexual ratio. The 770 chipmunks examined for this part of the study are sexually divided into 253 adult males, 168 juveniles, males, 201 adult females and 148 juveniles, females, which shows, that there are 72 more males than there are females, 52 of which are adults. There are several reasons why a larger number of adult males are caught than adult females. The most important of these are: the males emerge first in the spring and are very much more active during the breeding season and retire somewhat later in the fall. These reasons do not apply to the young, which are only recorded as such when they are under six months of age, so the figures given for the juveniles should be a true index of the ratio of one sex to the other (100♂ to 88.1♀).

Voice and its Use. A large number of birds and mammals of widely separated families are able to convey information of vital importance to one another by means of a great variety of different sounding calls, some of which are soft and plaintive while others are harsh and guttural, yet there is something similar about them all which enables their meaning to be understood without hesitation. Perhaps the one most widely known is that which gives warning of lurking danger, the presence of a hawk, man or something which is strange and unknown. The chipmunk understands all these signals of danger and its own soft call of warning is as widely known as that of any other animal. Its voice has remarkable carrying qualities and is so misleading, ventriloquistic, that were it not for

the upward flick of its tail at each note, it would seldom be located by sound alone, which means the chipmunk can give warning to all within range of its voice without undue danger to its self. The sudden bursts of high pitched notes given as the chipmunk springs from concealment to dash away for cover are very confusing to a dog, which more often than not, runs in any direction but the one taken by the chipmunk. Besides the slow notes of warning and the quick spluttering getaway notes, there are a large variety of soft friendly, talkative, notes used during the breeding season and when mother and young are together, there are many variations in the rapidity and tone of these notes which give them different meanings, all of which are understood by the chipmunk.

Breeding and young. The breeding season begins two weeks after the females emerge from their winter homes, but the time for mating depends somewhat on whether the spring is early or late. At first there is some mild fighting and a great deal of chasing one another and playing about, which activities become more intense as the time for mating approaches. Soon after mating has taken place the chipmunks lead a normal life. However, the females soon become more secretive and lead a quiet unobtrusive life until some days after their young are born. I have been unable to ascertain the exact length of the gestation period from watching chipmunks at large, but exact observations made with chipmunks kept in captivity show it to be from 28 to 30 days.

The following table gives the dates on which pregnant females have been killed and examined, and the four columns show the number of embryos carried by each.

| Date | Females | Embryos | | | |
|---------------------|---------|---------|----------|-------------------|---------|
| April 25..... | 1 | 0 | 5 | 0 | 0 |
| April 26..... | 2 | 4 | 5 | 0 | 0 |
| April 28..... | 2 | 0 | 5 | 0 | 7 |
| May 1..... | 1 | 0 | 0 | 0 | 7 |
| May 2..... | 2 | 0 | 5 | 0 | 7 |
| May 3..... | 4 | 0 | 5 | 6.6 | 7 |
| May 6..... | 2 | 0 | 5 | 6 | 0 |
| May 7..... | 2 | 0 | 5 | 0 | 7 |
| May 8..... | 1 | 0 | 5 | 0 | 0 |
| May 9..... | 1 | 0 | 5 | 0 | 0 |
| May 11..... | 2 | 4 | 5 | 0 | 0 |
| May 15..... | 3 | 0 | 5.5 | 6 | 0 |
| May 13..... | 7 | 0 | 5.5.5. | 6.6.6 | 7 |
| May 14..... | 2 | 4 | 5 | 0 | 0 |
| May 16..... | 2 | 4 | 5 | 6 | 0 |
| May 18..... | 4 | 0 | 5.5 | 6 | 7 |
| May 19..... | 1 | 0 | 5 | 0 | 0 |
| May 25..... | 1 | 0 | 5 | 0 | 0 |
| Total | 41..... | 16..... | 105..... | 54..... | 49..... |
| Total Embryos | | 224 | | Average 5.46 | |

Young have been found in their nests, 3 on the 19th, 5 on the 21st, 5 on the 23rd, and 4 on the 25th of May.

Shortly after the birth the young are, light red, or pinkish red and slightly transparent; skin soft, smooth and hairless; eyes closed; ears slightly raised, covered by thin, tissue-like, skin; gums toothless. The measurements and weights of, male L. 50. T. 16.5 F. 6.2 mm. W 2.21 gm. Female L 51. T 15. F 6.5 mm. W 2.36 gm.

Under normal conditions only one litter is born each year and that about the 22nd of May. But should the young be killed when only a few days old a second litter may be born in late June. However, I have no proof of this having taken place, other than that it has been a common practice with chipmunks kept in cages which often killed their young soon after birth and then mated again. One year three litters were born to one couple, the last in late September, which, I think, shows how unreliable are records compiled from animals kept in captivity.

Cleanliness. Chipmunks are above all extremely clean in their habits and their fur always looks fresh and bright, the hands and feet are used in combing and scratching the fur and the tongue for washing it. Sand baths are often indulged in and thoroughly enjoyed. These I am inclined to believe are taken more for the purpose of controlling mites and fleas than for any other reason, as after shaking out the sand, the fur is thoroughly combed and washed.

Water. Our bird pond is a great attraction to small animals and less often large ones too, as deer frequently come to it and one night a black bear came for a drink. Chipmunks are constant visitors to it, especially on hot days. While they are always eager for a drink, I have never seen them enter the water for bathing. They can swim quite well but are not fond of doing so.

Age. I have been unable to determine the age to which chipmunks live under natural conditions. However my daughter Ann, reared several in captivity as pets, the last two of which were born in May 1934. These two lived together as great companions until the death of the female, Wendy, in the fall of 1939. Her mate, Peter, died the following year at the age of six years and four months. As these two were active all the year round, it is probable, that those in the wilds, which hibernate, or at least sleep a great deal

during the winter months, may live a year or so longer than these two did, but I have no proof of this.

Periodicity. Chipmunks, like all small animals and insects have their years of abundance, which are followed by others of scarcity. These periods are not shown clearly in my records and it will be some years before it can be shown that they follow each other in periodical order.

Food Eaten. An itemized list of the food eaten by chipmunks would include all of the cultivated grains; the seeds of a vast variety of grasses and broad leafed plants; numerous kinds of sedges; fruits and their seeds; acorns; nuts and cherry kernels; a great variety of tender green shoots of plants and grasses; a very long list of insects, their larvae and eggs, which would include grasshoppers, June beetles, cutworms and a host of other harmful and beneficial species. I have no records of young birds or birds eggs being eaten and the fearless way in which wrens and other small birds chase them, indicates that they seldom get the chance of doing so. They seldom eat flesh and unlike ground squirrels they do not eat their dead.

Some years ago when strawberries grew in profusion in our hay meadows and woods I often found little heaps of strawberries with every seed removed and less frequently blobs of seeds stuck in the rough bark of trees. While chipmunks were suspected it was some time before I saw one gathering the fruit and removing the seeds to its pouches. If left alone a few chipmunks will soon strip every gooseberry from a bush, cut the berry open remove the seed and discard the pulp. Currants are treated in a similar manner and lately some chipmunks have learned to cut open Siberian crabapples to get their pips. About the only nut like-berry that I have never known them to eat is poison ivy, which is strange, as squirrels gather large quantities for winter use and deer and grouse are very fond of them.

Food Stored. Soon after emerging from their winter homes in the spring on until they retire in early winter, chipmunks devote much of their time to gathering and storing away food for future use. What the actual amount is in a normal year I am unable to say, but it must be at least three or four times as much as is eaten during the period of activity and used during the winter months. At first this may appear to be a great waste of food and

energy on the chipmunk's part, but when we realize that a large amount of this food is found and eaten by ground squirrels, mice and birds, and that some years many of the more important food crops are ruined by frost, drought or excessive rain, we see the necessity of each crop being harvested as it ripens and the importance of as much as is possible being placed in storage for future use. The most important of the many different kinds of seeds stored up for winter are cherry kernels, acorns, cultivated grain, hazel nuts and rose and saskatoon seeds. All of these are rich in food value and all, with the exception of the grains, will not grow until the following spring.

Food is seldom taken to the home as gathered, but rather hidden away within 100 yards of where found. Acorns and nuts may be buried singly, but small seeds are emptied into shallow holes from the large cheek pouches which hold about 75 cherry kernels or 100 grains of wheat; later much of this food is dug up and eaten as wanted or carried off to the winter home, which may be over 400 yards away.

Nests. The situation in which the nest is to be made depends somewhat on whether it is for summer or winter use and the kind of habitat the chipmunk happens to be living in. The summer nest is often made in hollow trees, old woodpecker nests, decaying logs or some place that will give it protection from rain and ground moisture. The choice of a place for the winter nest is much more important as it must provide protection against frost. The chipmunk has found that the interior of a wood which has a thick carpet of decaying vegetation on its floor and in which the snow may lie undisturbed by the wind as it falls is most satisfactory for this purpose. In such a situation the nest may be made only a few inches below the surface and yet receive sufficient protection even though there may be seventy or eighty degrees of frost in the air a short distance above. I have found nests made of rabbits' hair, cotton wool gathered from poplar and willow catkins, deer hair, small and cut up feathers, the inner bark of small dead trees, silky fibre gathered from grass and fibrous plants, finely shredded grass and many combinations of these and other widely different substances. Those which are naturally soft and fluffy are used as found, while coarser materials are worked over with hands and teeth until they are made fit for use, then they are packed neatly

into the front of the mouth with the hands and either taken to the nest or hidden away for future use. The nest, which is never large, is often added to and parts that have been in use for some time may be taken out, aired and replaced or discarded. This probably helps in controlling mites and fleas and may retard the spread of mould in the nest.

Winter homes. The winter home is very hard to find. In my efforts to locate them I have put out food and nest making materials in the hope that one of the chipmunks making use of them would lead me to its home, but they have never done so. I have had much better luck in following their tracks made on soft snow and some interesting homes have been found in this way. A typical example is shown, Fig. 1. This was found on the 8th of November 1934 in a thick wood at the foot of a willow bush, part of which had been broken and bent down. This was used by the chipmunk in getting to and from the mouth of a tunnel which led to the entrance of the home. The hole curved sharply to the right and in a length of twenty-five inches reached the store and nest chamber eleven inches down. This chamber was $5\frac{1}{4}$ inches high and $6\frac{1}{2}$ inches across. The winter store of cherry kernels and rye which weighed 528.5 gm. was beneath and well up on three sides of the nest which was made of finely shredded grass lined with rabbit hair.

A rather unusual home found in thick grass close to the edge of a wood on the 30th of October 1936, is shown, Fig. 2. The original entrance had been filled in and a second one made to the side of it. The hole, fifty-six inches long, made a complete loop before reaching the store and nest chamber thirty-two inches below the surface. The store and nest chamber, $6\frac{1}{2} \times 5\frac{1}{2}$ inches, contained 6,369 choke and pin cherry kernels, 5,116 grains of wheat, 63 shelled acorns, 40 grains of rye and a small amount of millet seed, weight 465 gm. The nest was made of finely shredded grass, much of it *Oryzopsis cuspidator*, the top leaf of which is very stringy and becomes fine and silky with age.

A store found in an old log building contained 478 acorns, most of them shelled and 2,734 mixed cherry kernels, weighing 799.39 gm. The nest was made of grass and feathers. Another store consisted of 167 hazel nuts and several thousand cherry kernels; these were not counted or weighed. The nest was made of finely shredded bark and grass with some deer hair mixed in.

Fig. 1.

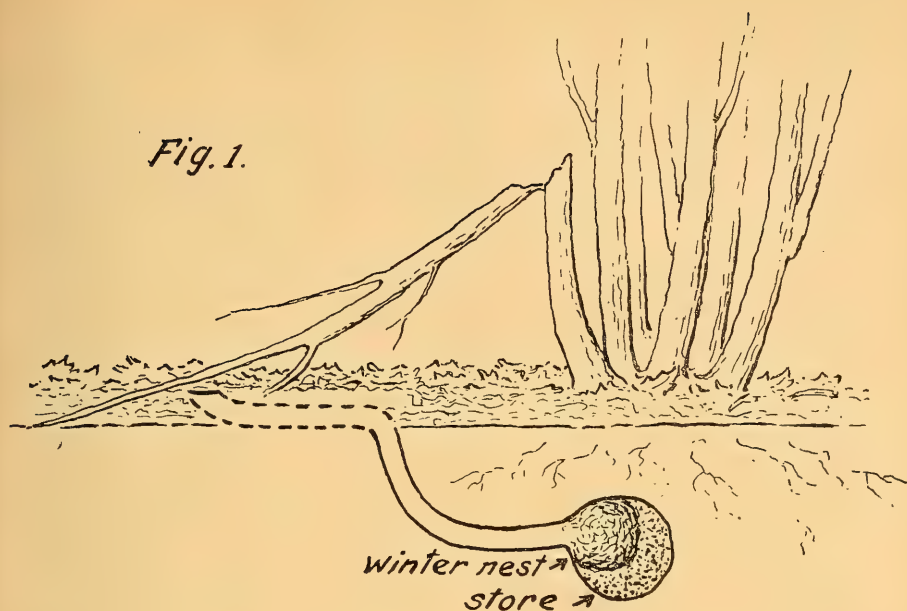
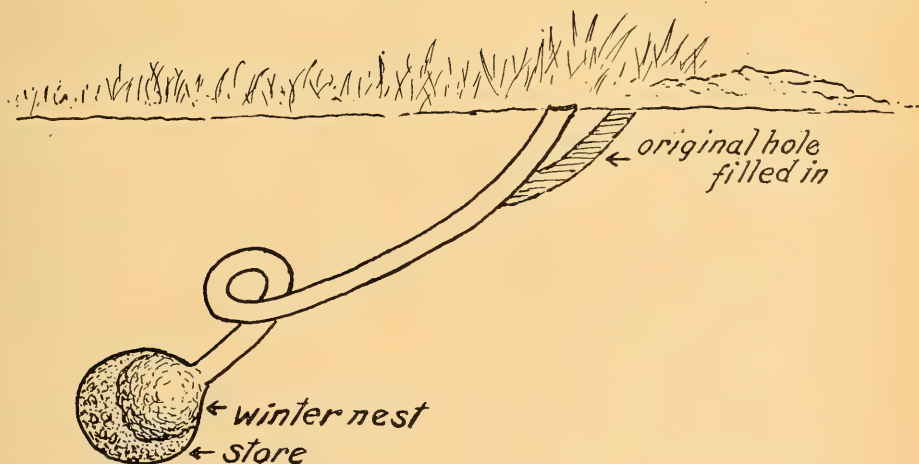


Fig. 2



I have one record of a chipmunk digging to a depth of 37 inches, this is exceptional as the average depth is less than two feet. However when a pocket gopher or ground squirrel's hole is used they may make their store and nest chamber in it at a much greater depth than any hole dug by themselves.

Hibernation. While it is possible that chipmunks hibernate for about five months, their winter sleep must be relatively light and constantly broken by wakeful moments of sufficient length to enable them to take food and to attend to their toilet. It is impossible to give any exact time for their retirement

in the fall, as I have seen them out at different times during every month of the winter. However, as the days of October shorten the chipmunks become less active and are only seen during the hours of bright sunshine. A few are nearly always seen in November, from then until the middle of March they are only occasionally seen and the majority do not become really active until the first or second week of April.

Economic Importance. The relation of the little northern chipmunk to agriculture and its allied sciences is, as a whole, of little importance, as the relative amount of damage done by them is usually very small and often offset by the beneficial habits they have of eating noxious insects and planting tree seeds in places where they have a chance to grow. However, there are isolated districts in which farms are being cut out of the virgin forest where the loss of even a small

amount of grain may mean a great deal to the farmer. In the forests chipmunks eat and store away large quantities of tree seeds, a very large percentage of which would never have a chance of growing if left where they fell, but when carried to more open ground and buried an inch down, some of them have a chance of growing into useful trees. So, even though chipmunks do eat a lot of seeds, they also plant a great many more and in this way pay for those they eat. Occasionally a small amount of damage is done to garden crops, more especially to small fruits, the seeds of which are greatly prized as food. Such damage can always be prevented, or quickly stopped, as chipmunks are very easily trapped or shot. Perhaps it is just as well that the little northern chipmunk is of small economic importance as through its charming personality alone, it holds a very high place among the many beautiful things of our country.

HOARY BAT, *LASIURUS CINEREUS*, AT SOUTHAMPTON ISLAND, N. W. T.

By HAROLD B. HITCHCOCK

University of Western Ontario, London, Ontario

A FEMALE HOARY BAT, *Lasiurus cinereus* (Beauvois), was caught at Southampton Island, Northwest Territories, on June 17, 1942, by Harry Gibbons. Southampton Island forms the northwest boundary of Hudson Bay. Bear Island, the spot where the bat was found, lies in South Bay, at latitude 64° N. and longitude 83° W. All the surrounding country is typical tundra, Bear Island being over five hundred miles from the tree line. The bat has been preserved in alcohol and shows a well developed foetus dangling by the umbilical cord, while probing reveals another of similar size within the body. The specimen has been presented to the National Museum of Canada by the Hudson's Bay Company, (Catalogue of Mammals, No. 17246) through the efforts of whose Fur Trade Department it was sent to the writer for identification.

This record is the first for the hoary bat beyond the wooded or Canadian zone. The fact that natives at Bear Island apparently had never before seen a bat indicates that its occurrence there is not regular. On July 12, 1907, Seton (1911, p. 358) saw a hoary bat at Fort Resolution, Northwest Territories.

Preble (1908) collected a large female of the species on the Athabaska, near the mouth of the La Biche River, Alberta, on August 29, 1903. He reported that his boatmen were not familiar with the animal and expressed his belief that, though rare, the hoary bat probably occurs regularly in Alberta and southern Mackenzie. Anderson (1934) in his account of the mammals of the Hudson Bay area lists only the little brown bat, *Myotis l. lucifugus*, a specimen of which has been taken at Rupert House, on the east shore of James Bay. Judging from the published records bats do not often penetrate beyond the tree limit in the Hudson Bay region.

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PREDATION EFFICIENCY OF THE OSPREY ¹

By GNR. GORDON LAMBERT
104th Heavy Battery, R. C. A. (C.A.)

DURING THE LATE SPRING and summer of 1942, opportunity was afforded me to make records of the predation efficiency of the Osprey (*Pandion haliaeetus*), at Government Point, Shelbourne, Nova Scotia. Ospreys were very common throughout this period. As an indication of their abundance, two large daily totals are mentioned, as follows: On May 9, forty-three individuals were seen in the air at one time, and on July 14, thirty-two individuals were observed. Several local fishermen assured the writer that the "Fish Hawk" nested in the region.

Ospreys travel up and down the coast, hovering periodically to search the waters below. It was apparent from repeated observations that they follow a fairly definite procedure in hunting and in making a strike. When a possible quarry is detected, the osprey immediately lowers altitude. It drops several feet, hovers, drops again and hovers, as if an exact target were being singled out. This terrifying readjustment of position was repeated more times if the bird were originally flying high. The final strike of the osprey usually

was made from a height judged to be thirty to forty feet.

Two methods of striking were observed. The first and most common appeared to be made for fish swimming at some depth. It was a definite plunge into the water. With the wings held back, the bird would drop abruptly into the water, the feet extended well forward. Emerging, the osprey would rise several feet, and by quick wing-beat, shake the water from its plumage. The second method of striking was employed on occasions when the prey was swimming near the surface of the water. In such instances, the bird 'pancaked' on the surface, the feet only being submerged.

Although the large number of strikes observed probably includes repeats on the part of certain individuals, unquestionably it concerns the actions of many individuals. The efficiency, as determined by success or failure therefore applies to the species in this region not merely to a few expert individuals. Table I includes the results of 469 completed strikes resulting in the bird coming in contact with the water.

Table I

| Period | Number of Strikes | Success | Failure | Efficiency Index (%) |
|------------------------------------|-------------------|---------|---------|-------------------------------------|
| May 2-20 (19 days) | 162 | 155 | 7 | 95.68 |
| May 21-June 15 (26 days) | 41 | 39 | 2 | 95.12 |
| June 16-July 24 (39 days) | 102 | 82 | 20 | 80.39 |
| July 25-29 (5 days) | 51 | 46 | 5 | 90.19 |
| July 30- Aug. 5 (7 days) | 51 | 43 | 8 | 84.31 |
| Aug. 6-12 (7 days) | 41 | 36 | 5 | 87.80 |
| Aug. 13-25 (13 days) | 21 | 18 | 3 | 85.71 |
| Total May 2- Aug. 25 (116 days) | 469 | 419 | 50 | Aver. Efficiency Index (%) 89.34 |

1. —Received for publication January 18, 1943.

It will be noted that the above table shows a falling off of efficiency as the season advances. This may result from at least two causes. Presumably higher water temperatures toward mid-summer would inhibit fish from coming close to the surface of the water frequently, thus increasing the difficulties of capture. Also, the observations made on later dates probably included young ospreys. These would be less efficient predators because of inexperience.

The following notes concerning the migration of the Osprey in the Shelbourne, Nova Scotia area are appended: The southward migration began about the middle of August in 1942. On September 11, four birds were seen flying southwest. These appeared to mark the last of their migration that year. However, a lone bird with a number of feathers missing from the left wing was seen on October 18. This individual may have been an injured bird and therefore the date can not be regarded as normal.

NOTES AND OBSERVATIONS

YELLOW-HEADED BLACKBIRD AND GOLDEN EAGLE IN MIDDLESEX COUNTY, ONTARIO.—On the morning of June 13, 1942, Mr. Arthur A. Gleason saw an adult male yellow-headed blackbird (*Xanthocephalus xanthocephalus*) in a field beside the University of Western Ontario drive, on the outskirts of London. Mr. Gleason observed the bird at close range for ten minutes as it perched on weed stalks which topped the grass. The song ("a rather unmusical repeating of the same or slightly varying pitched notes" - A.A.G.) was also heard. This sight record brings the list of birds for Middlesex County to 263 species plus 6 subspecies, according to records previously published by Saunders and Dale (1933) and Dale (1941).

It is interesting that only two days before the London record a male yellow-headed blackbird was reported by Beardslee (1942) at Batavia, New York, some 180 miles east of London. In southern Ontario the bird has been found only a few times. The Royal Ontario Museum of Zoology has a specimen collected at Toronto about 1885, and Dr. W. E. Saunders of London has in his collection one taken June 18, 1906, at Point Pelee. According to a newspaper item one was seen by A. J. Glover in May, about twenty years ago, in Woodstock. Two others have been seen, on April 29, 1940, and May 19, 1941, at the Bradley Marsh, at the mouth of the Thames River, on the shore of Lake St. Clair, according to a mimeographed check-list for the Bradley Marsh issued April, 1942, by the Kent Nature Club, Chatham.

A golden eagle (*Aquila chrysaetos*) was shot about November 15, 1942, at Ailsa Craig. Although accused of killing turkeys the

bird had an empty stomach. The skin has been added to the zoological collection at the University of Western Ontario. This is apparently the third time the bird has been reported in Middlesex County. One now in the Saunders collection was caught at Lambeth in December, 1900, and another was seen at Byron in February, 1929, by Eli Davis, according to Saunders and Dale (1933). Dr. Saunders has seen the species on several occasions at Point Pelee.

Judging from the records both of these birds are rare in southern Ontario. The yellow-headed blackbird is a bird of the Great Plains, and those individuals which get to southern Ontario have probably strayed from the normal range of the species. The golden eagle, on the other hand, breeds to the north and, since it is a migratory species, might be expected to pass through southern Ontario on its way to and from the south. The scarcity of records may indicate that it does not regularly pass through this area, or that it escapes notice or is confused, when seen, with the more common bald eagle.

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—HAROLD B. HITCHCOCK, UNIVERSITY OF WESTERN ONTARIO, LONDON, ONTARIO.

THE FRESHWATER LEECHES OF PRINCE EDWARD ISLAND and the Problem of the Distribution of Leeches¹

By L. R. RICHARDSON

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THE FRESHWATER LEECH fauna of Prince Edward Island is small, but of particular interest since it offers a potentially significant contribution to the knowledge of the process which has brought about the present wide distribution of some of these animals. Moore (1922) records the occurrence of *Theromyzon occidentale* (Verrill) and *Haemopis marmoratis* (Say) in Prince Edward Island from his studies on collections of leeches from southern Canada. So long as the fauna was known to consist of only these two species, we might accept their presence on the Island as having resulted from some accidental or passive mechanism of distribution such as transport by other animals, e.g. aquatic birds. This is quite acceptable in the case of *T. occidentale* since this leech is known to be capable of serious infestation of such birds and has been recorded from the nasal cavities of coots, grebes and blue-winged teal (Sooter, 1937). In this habit it resembles the European *T. tessellata* (Muller) which has also been recorded (de Guerne, 1892) from the plumage of aquatic birds. On the other hand, the possibility that *H. marmoratis* has reached the Island in this fashion is more remote, since this leech is essentially predatory in habit, only slightly sanguivorous and in my experience by no means given to prolonged blood-sucking or attachment to an object which has been removed from the water.

In 1939, I had the opportunity of collecting from three permanent water-bodies in Prince Edward Island. The material obtained includes *H. marmoratis* and six species additional to those recorded by Moore, and in thus raising the fauna to eight species fresh consideration can be given to any hypothesis of passive mechanisms in connection with the distribution of leeches in North America. This material was obtained from the Murray River, Lake Verde and O'Keefe Lake. At various times in that year and the previous one, I was able to examine several non-permanent water-bodies in the vicinity of Malpeque Bay, but without result.

Lake Verde and O'Keefe Lake are East of Charlottetown and situated close to Road 48. They are closely similar in nature, both being small shallow lakes with a clean sandy bottom for the most part. Aquatic vegetation is restricted to small patches of reeds out in the lake and a narrow fringe of reeds along the shore. Available shelter for leeches is scanty and limited to logs and fragments of timber in Lake Verde and scattered lumps of sandstone in O'Keefe Lake. Murray River contrasts completely with these waters. Collections were made close to the mouth of the river where a long established dam holds back the water well above tidal influence and forms a mud-bottomed pond which is shallow for the greater part of its area but reaches a depth of some fifteen feet close to the dam. This pond possesses an abundant aquatic vegetation composed mostly of *Potamogeton Myriophyllum* and *Utricularia*. Rushes fringe the margin of the pond. The outlet stream runs through a narrow cutting and is floored with boulders.

The material collected is not morphologically distinct from the typical specimens of the mainland. *Glossiphonia complanata* (Linnaeus) was abundant at the Murray River where it was found on the lower surface of planks, logs and stones in regions where the bottom was firm. *Helobdella stagnalis* (Linnaeus) was taken from the same locations, and also occurred among the rushes. A single specimen of *Dina fervida* (Verrill), the only gnathobdellid collected at this location, was found concealed under a log on a small patch of sandy bottom. Careful search was made for other gnathobdellids, and for their cocoons which can be readily detected when such leeches are present, but without success and it appears that the single *D. fervida* was exceptional at this location.

Macrobodella decora (Say) was present in both O'Keefe Lake and Lake Verde. Young specimens were abundant in the latter location and were seen swimming actively in shallow water only two to six inches in depth. Two adults were taken, both heavily pigmented on the ventral surface. A single

1.—Received for publication February 5, 1943.

H. marmoratis was taken from Lake Verde. Young *Haemopsis grandis* (Verrill) were taken at both lakes, and five adults were found in O'Keefe Lake. A single specimen of *Dina fervida* (Verrill) was taken from O'Keefe Lake, and a single immature specimen of *Nephelopsis obscura* (Verrill) from Lake Verde. Gnathobdellid cocoons were abundant at both localities.

The sharp distinction between the leech fauna of Murray River and of Lake Verde and O'Keefe Lake is not exceptional in consideration of the contrast in nature between these two types of water, and I do not feel that any significance can be attached to this feature of the collections. A clear knowledge of habitat preferences among leeches has not yet been developed, but in my experience such preferences as are expressed are related to the available shelter as much as to any other factor. A preponderance of gnathobdellids and a virtual absence of rhynchobdellids is common in waters where the bottom is of sand and shelter is scanty. Likewise the virtual absence of gnathobdellids from Murray River is not without parallel.

The present records complete the range in Canada from Alberta (Bere, 1929) to Prince Edward Island for *H. stagnalis*, *G. complanata*, *H. grandis*, and *N. obscura*; from Saskatchewan (Moore, 1922) to the Island for *M. decora*; and Ontario (Moore, 1922) to the Island for *D. fervida*. Throughout these ranges, the only major barrier to the distribution of these leeches is the Northumberland Straits which separate the Island from the mainland by a strip of sea nine to thirty miles in width. If we attempt to maintain the hypothesis that the leeches of Prince Edward Island have been transported across this strip of water by passive means, we must be prepared to accept that this has happened on at least eight separate occasions and it is apparent that in each case the leech must have remained attached to its host for a period of not less than fifteen minutes in order to have made the crossing in this fashion.

Transport in this way is undoubtedly available from Sooter's observations for *T. occidentalis*, and also for *H. stagnalis* which Moore (1924) mentions is distributed by migrating ducks and cranes. The possibility might also be extended to *G. complanata* which is also cosmopolitan, of small size, shares the same habitat and has many of the habits of *H. stagnalis*. It might occur also

for *M. decora* which is sanguivorous, actively searches out its prey and is by no means timid; but it is less probable for *H. marmoratis* which is quite timid in behaviour, and quite improbable for the secretive, non-sanguivorous species such as *H. grandis*, *N. obscura* and *D. fervida*. These species follow the gnathobdellid habit of depositing their eggs in cocoons which are firmly attached to stones, sticks, logs, weeds etc. Sheer accident might bring about transport of the eggs of one species on one occasion but it would be rather remarkable to have this fortunate accident occur for each of the three separate species, and it is more reasonable to assume that this means of transportation is restricted to juveniles and adults.

Consideration of the habits of these species only serves to emphasize the improbability of the transport of these stages in this fashion. *H. grandis*, *N. obscura* and *D. fervida* are timid species and lacking jaws are incapable of sucking blood. They are sensitive to disturbance in the water and quickly seek fresh shelter when exposed. They do not attach themselves firmly to objects in the water and they release their hold readily when such objects are moved. *N. obscura* and *D. fervida* are nocturnal and emerge from shelter at night, but are still timid and seek concealment quickly on the least disturbance even at these times when they are actively moving around. None of this behaviour seems compatible with a fifteen minute flight concealed in the plumage or attached to the feet or hidden in the nasal passages of a bird.

Moore (1922) records only *G. complanata* and *N. obscura* from the small collections made by Dr. Huntsman in New Brunswick near St. John. I have collected these species and in addition *H. stagnalis*, *M. decora*, *Eripobdella punctata* (Leidy), *H. marmoratis*, *H. grandis* and *D. fervida* from various points on the St. John River in New Brunswick, but my own collections for this system are casual and by no means complete. Moore also lists *Placobdella phalera* (Graf), *Placobdella rugosa* (Verrill), *Piscicola punctata* (Verrill), *M. decora*, *H. marmoratis* and *E. punctata* from Nova Scotia. It is quite clear that the distribution of the leeches of Eastern Canada is by no means completely known to us, and the discovery of many more species can be anticipated in New Brunswick waters. Further work will probably reveal more species in Prince Edward Island since collections there,

including my own work, have been very limited.

Demonstration of equivalence in the leech faunas of Prince Edward Island and adjacent regions on the mainland will strengthen the present concept that the leeches of the Island have reached their present distribution by direct means such as the migrations which I have recorded (Richardson, 1942) for *H. mar-moratis*. This concept is put forward at the present time since it is apparent that only in the case of two species can we consider transport by birds as occurring with any certainty; in the case of three species the possibility for such transport is reasonable; but in the case of the three remaining species, the possibility is limited to the most exceptional accidental conditions so as to render it improbable that these species have reached the Island in this fashion.

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BOOK REVIEW

A GAME WARDEN TAKES STOCK, by Captain C. R. S. Pitman; 8vo, pp.287, 39 illustrations, index. James Nisbet and Co. Ltd., London, 1942; 16/- net.

Popular magazines have lately borne advertisements hinting that plans have already been made for developments in aerial travel after the war that will enable us to visit the wilds of Africa or Central Asia as easily as we now cross our native continent. When this comes to pass people from all parts of the world will be making vacation trips to see the wild life of Africa. Books, articles and films dealing with the great national parks, where animals live unmolested, subject only to Nature's law of survival, have prepared the way.

However Captain Pitman's book does not deal with the parks whose names are familiar to us. Instead, it deals with the wild life of Uganda, one of the well populated and productive regions of Africa. He shows it to be rich in wild life, having, indeed, several preserves worthy of park status, were funds for administration as such available. Captain Pitman's specialty has been smoothing out the relationship between potentially destructive mammals and agricultural man; and his great-

est achievement in this respect, known as "elephant control" seems to depend in part for its success on the intelligence of the elephant, whose habits are changed by well directed control efforts. Uganda has 20,000 elephants.

The Game Warden is particularly informative on the six "vanishing species" in his charge, those threatened with extinction. They are the gorilla, chimpanzee, white rhinoceros, black rhinoceros, Uganda kob and giraffe. With the exception of the kob, an antelope, they come straight from the pages of our childhood animal books and the intimate stories of their habits are a delight. One sees that these animals are in good hands and unlikely to vanish. Delightful, too, are accounts of Uganda's numerous hippos and the lion stories vie with the best.

It is in his discussion of the Mabira forest, an outlying area of rain forest, and in his "flotsam and jetsam", interesting stories of all sorts of wild life, that the Game Warden is revealed as a true naturalist whose vision catches the glitter of every facet of the rich gem of nature. Game wardens of this calibre are rare, and rare also are accounts of wild life so full of interest and information.

—C. H. D. CLARKE

A PRIOR NAME REVIVED FOR THE BEAN MOUSE¹

By R. M. ANDERSON
National Museum of Canada

THE NATIONAL MUSEUM OF CANADA has 57 specimens of this pale yellowish race of meadow mouse of the badlands and semiarid regions of the northern Great Plains which has for some years been referred to *Microtus pennsylvanicus wahema* Bailey (1920). These include one topotype of *wahema* from Glendive, Montana, presented by Mr. Morris M. Green in 1927, eighteen specimens from southeastern Alberta and thirty-eight from southwestern Saskatchewan, and the writer has also referred nine other specimens in the collection of Mr. J.D. Soper from the same general region to the same form. While examining the large series of western forms of *Microtus pennsylvanicus* in the U.S. National Museum collection at Washington in 1931 and comparing them with material from the National Museum of Canada, the writer was informed by the late Mr. Vernon Bailey that he considered the specimens in the U.S.N.M. from eastern Montana and western Dakota labelled "*modestus*" at that time should be placed with *M. p. wahema* Bailey. Shortly afterwards the writer examined the series of *M. p. modestus* (Baird) in the American Museum of Natural History, New York, and found the type specimen of *Arvicola insperatus* Allen (1894) which had been placed in synonymy and later labelled *modestus*. He examined the specimen, a very pale yellowish meadow mouse, and found it to be identical with *wahema* in essential characters, and the four paratypes from the same locality are

referable to the same form. Recent studies on this group make it seem desirable to place these observations on record by publication and to revive the name *Microtus pennsylvanicus insperatus* Allen (1894) for the subspecies ranging from southwestern South Dakota (and probably parts of northeastern Wyoming), Eastern Montana and parts of southeastern Alberta and southwestern Saskatchewan, and relegating *Microtus pennsylvanicus wahema* Bailey (1920) to synonymy. The form may stand as follows:

Microtus pennsylvanicus insperatus J. A. ALLEN.

BADLANDS MEADOW MOUSE. BEAN MOUSE

1894. *Arvicola insperatus* J. A. ALLEN
Bull. Amer. Mus. Nat. Hist., New York,
Vol. 6, p.347. December 7, 1894.

(Type — 8105/6731, A.M.N.H., male adult, Custer, Black Hills, Custer County, South Dakota).

1912. *Microtus pennsylvanicus modestus* (Baird), MILLER, List N. A. Land Mammals in U. S. N. M., 1911, p. 214.

(Type — 594/1717 U.S.N.M., Cochetopa Pass, Saguache Co., Colorado).

1920. *Microtus pennsylvanicus wahema* BAILEY, Journal of Mammalogy, Vol. 1, p. 72. (Type—No. 212370, U.S. Nat. Museum, Biol. Surv. collections, male adult. Glendive, Dawson County, Montana).

NOTES AND OBSERVATIONS

WESTERN JUNCO RECORDED IN ONTARIO— Toward the end of January of this year (1943) a flock of Juncos began coming to a feeding station at my house near Streetsville (Peel County, Ontario). On February 10 I noted in my diary that one of them "strongly resembles a Western Junco". This assumption was based on the fact that the bird's head appeared blacker than its fellows'; that its sides were pale buff instead of grey; and above all

that the black on the breast was in the form of a bib with a convex outline.

An inspection of skins in the collections of the Royal Ontario Museum of Zoology, Toronto, confirmed my observations and on February 27, T. M. Shortt of the Museum collected the specimen (now No. 68390♂). It is without doubt a specimen of *Junco oreganus*, most closely resembling the race *montanus*, according to Mr. Shortt. It appeared to be the first recorded from Ontario. —MARGARET H. MITCHELL, R. R. 1, Streetsville, Ontario.

1. —Received for publication, March 15, 1943

NOTES ON NATIVE ORCHIDS

By F. H. C. DEMPSEY,
Hamilton, Ontario

ALWAYS HAVING HAD a keen interest in our native plants growing in their natural habitats I have roamed the woodlands and meadows and found many rare and beautiful specimens. My explorations have extended over many of the plant groups including the ferns and aquatics, but my especial joy has been our native orchids.

Many of the orchid specimens which I have found have taken kindly to cultivation in my garden. Cultivation and care have improved some of the plants beautifully. *Cypripedium reginae* Walt., the Showy Lady's Slipper, has done exceptionally well for me. One of the plants had five stems in bloom at once, one stem with three blooms and three others with two each. The colours were white marked with pink to crimson.

The large Yellow Lady's Slipper, *Cypripedium Calceolus* L. var. *pubescens* (Willd.) Correll, also adapted itself well to the garden. One particularly fine plant bore four blossoming stems for years, three of the stems with two blooms, the flowers yellow suffused with mahogany red. The smaller variant of this yellow *Cypripedium* also improved with cultivation. I had plants with as many as twenty stems in bloom at once, almost half of them with two blooms each.

Other retiring residents of the seldom visited woodland bogs which I have transplanted successfully into my wild flower garden are two additional Lady's Slippers. *Cypripedium candidum* Muhl., the White Lady's Slipper, with its polished enamel-white slipper, purple-veined within, did well for me, and a foreigner from the Rocky Mountain region, *C. montanum* Dougl., the Mountain Lady's Slipper, also with a white lip and beautiful purple markings had as many as nine blooms on a stem.

Among the rarest of the orchids which I have found is the seldom seen Ram's Head Lady's Slipper, *C. arietinum* R. Br. It was growing in a swamp near Freelton in Wentworth County, Ontario. Another infrequently observed inhabitant of Wentworth County I located in a ravine north of the highway leading up to the Clappison Cut. This was the rare Helleborine, *Epipactis latifolia* (Huds.) All., which has been reported from

this region as found in High Park, Toronto, only.

I have also seen Wister's Coral-root, *Corallorrhiza Wisteriana* Conrad, near Bala in the Muskoka District. It had eight and nine blooms on a leafless stem and was most beautiful with its white and purple-spotted corolla.

Also from near Freelton in Wentworth County, growing in a bog, I have taken *Habenaria dilatata* (Pursh) Gray, the Tall White Bog Orchid, with its waxy greenish-white corolla and the Yellow Lady's Slipper *Cypripedium Calceolus* L. var. *pubescens* (Willd.) Correll. I have also found an orchid with an entirely green flower, the Tall Leafy Green Orchid, *Habenaria hyperborea* (L.) R. Br. This last bloomed in my garden for several seasons although it finally died out this year.

Another pretty little plant which I have come across is the Fringed Polygala, sometimes called 'Bird-on-the-Wing', *Polygala paucifolia* Willd. This of course, is not a true orchid, but its beautiful pink superficially orchid-like bloom causes it to be mistaken as such by many.

The Laurentian district is a natural home for orchids. Some species are abundant here which elsewhere are quite rare. While roaming through the hills four years ago I came across the Small Purple Fringed Orchid, *Habenaria psycodes* (L.) Spreng. I transplanted this to my garden and it bloomed well, an orchid-pink. This year I was fortunate enough to locate *H. fimbriata* (Ait.) R. Br., the Large Purple Fringed Orchid growing on a hillside and in a damp meadow. It was a foot to a foot and a half tall and in both types of habitat the bloom was nearly white in colour.

While visiting my niece at Long Lake in the Laurentians above St. Jerome, I had further opportunity to forage about in search of my favorites. We found *Habenaria fimbriata* (Ait.) R. Br. growing here in profusion as well as *Orchis rotundifolia* Banks, the Small Round-Leaf Orchis, with shiny green leaves, silvery white beneath and nearly round, and a spike of eight or nine greenish yellow flowers. Also located here was the

waxy white and honey-scented dainty little Ladies' Tresses, *Spiranthes odorata* Nutt.

With the assistance of my niece, I constructed a wild orchid bed of swamp muck and balsam needles. In it we planted *Habenaria fimbriata* (Ait.) R. Br., *Orchis rotundifolia* Banks, *Spiranthes odorata* Nutt., and *Cypripedium acaule* Ait. which is abundant in the woods there. When I returned home I sent her plants of *C. Calceolus* L. var. *pubescens* (Willd.) Correll and *C. reginae* Walt. to add to the collection. The bed is edged with Forget-me-not and Shin-leaf, *Pyrola elliptica* Nutt. called Lily-of-the-Valley by the local residents. Among the bordering boulders we planted the Beech fern, *Dryopteris Phegopteris* (L.) C. Chr.

Later we built a water garden near the rivulet in the meadow for the aquatics and

plants of wet ground. Here we set out Kentucky Gayfeather, Arrowhead and the Flow-ering Rush, *Butomus umbellatus* L., with white, pink-tinted blooms, found on Lake St. Louis near Lachine. Over the fence were tufts of the lovely silvery Lamb's Tail Grass.

We found Blue Iris to be common in the Laurentians, and also got Yellow Water Lilies, *Nuphar advena* Ait., on the bank of Long Lake, the same species which grows in twenty to thirty feet of water in the Marsh at Hamilton. We also put in some of the Blue Gentian, *Gentiana Andrewsii* Griseb. and white Turtle Head, *Chelone glabra* L. The whole effect was most satisfactory indeed!

I am grateful for the assistance of Mr. M. N. Zinck in preparing these notes for publication.

NOTES AND OBSERVATIONS

HOW BATS IN FLIGHT AVOID OBSTACLES — has been a problem for 150 years. It was solved recently at Harvard University by D. R. Griffin and R. Galambos (1943, *Flight in the Dark: a study of Bats*, *Scientific Monthly*, 56, pp. 155-162) with a series of brilliant and convincing experiments. Bats deprived of the use of various senses flew through a barrier of dangling wires. It was demonstrated that sight was actually a detri-

ment to the bat in avoiding the wires. They showed that supertonic sounds of some 50,000 vibrations per second (human ears have a hearing range of sounds with between 20 and 20,000 vibrations per second) uttered by the bats in flight are reflected from the obstacles. The bats hear these echoes, and so know where the obstacles are and avoid them. Thus the bats ears serve to guide the bat as it flies in the dark. —A. L. RAND.

ANIMALS USING TOOLS.— One of the Galapagos Island finches, a group commonly called Darwin's finches or ground finches, was discovered by David Jack in 1938 to have a behaviour pattern unique amongst birds. "In searching for insects in holes too deep for its bill to penetrate it avails itself of cactus spines. Probing with one of these spines held in its bill it is thus able to secure food otherwise unobtainable. This, so far as known, constitutes the only example discovered wherein a bird makes use of a tool." (1942 *Animal Kingdom*, 45, No. 6, pp. 142-145).

The sea otter of the Pacific coast of North America also uses a tool. It dives for its food,

which is largely shell fish and crabs, and brings it to the surface where it is eaten as the animal floats on its back. Sometimes the otter brings up a stone, apparently six inches or so in diameter along with some food object. The stone it balances on its chest, and on this stone it pounds the food object, possibly some mollusk, to crack it. The object is held with both paws, and with full arm action from well over the head is brought down hard. It may take several blows before the object is cracked so the otter can extract the food. (Edna M. Fisher, 1939, *Journal of Mammalogy*, 20, pp. 21-36). —A. L. RAND, NATIONAL MUSEUM CANADA, OTTAWA.

HIISTORY OF THE RACCOON (*Procyon lotor* L.) IN NOVA SCOTIA¹

By A. L. RAND

National Museum of Canada

SMITH (1940, *Amer. Midl. Nat.*, 24, p.225) summarized the status of the raccoon in Nova Scotia as fairly common in the Annapolis Valley, and occasional in the interior of the province. He cites Gilpin (1870, *Proc. and Trans. Nova Scotia Inst. Nat. Sci.*, 2 (part 2) p. 64) who wrote that during the preceding twenty years the raccoon had entered the province and spread along the north side of the Annapolis Valley and that it was strange to the Indians. Gilpin also pointed out that Lescarbot had described the raccoon from Nova Scotia about 1606, and that it had evidently disappeared in the period between and was now reappearing.

Lescarbot's description (1914, *Pub. Champ-lain Soc.*, Lescarbot, History of New France, Vol. III) of a beast called *nibaches* which had paws almost like those of an ape; a head like a fox; a grey coat; and of an incredible fatness is certainly this animal. It is of further interest that this word for the raccoon was not used by the modern Micmac.

Evidence of the occurrence of the raccoon in still earlier times is available in the Archaeological collection of the National Museum of Canada. From Pictou County we have the following material:-

From a shell heap on Quarry Island: 5 incomplete lower jaws that compare well with skulls collected in recent years in eastern Canada.

From a shell heap on Robinson Point, Big Island, Mengonish; two canine teeth.

From a shell heap on nearby Olding Island; two canine teeth.

The above were collected by Harlan I. Smith in 1914.

Smith and Wintemberg (1929, *Nat. Mus. Can. Bull.* No. 47) have described these finds in detail. Of the age of the material they say certainly prehistoric, but nothing indicates

they are very old. No object clearly belonging to the shell heaps has been obtained from the whites.

Among the bones from the Eisenhauer shell heaps, Mahone Bay, Lunenburg Co., of similar age Smith and Wintemberg (op. cit.) list those of the raccoon, and say its remains are more common than are those of the lynx, caribou, porcupine, woodchuck, muskrat and hare. We can assume it was common.

It appears that sometime before the arrival of the European in Canada raccoons were common and widely distributed over the mainland of Nova Scotia, not only in the Transition Zone of the Annapolis Valley, but through the Canadian Zone as well, to be common at Mahone Bay. It apparently existed up until the beginning of the seventeenth century when Lescarbot recorded it with its Indian name.

Evidently then it disappeared and the Indians lost all knowledge of it, including the name. In Gilpin's time (1870) it was reappearing again and is now fairly common over parts of the province.

Such evidence and similar evidence for the white-tailed deer, should be carefully considered when evaluating the balance of nature, and in broad views of conservation. Certain animals have evolved, flourished and waned; perhaps with successive periods of abundance without aid or hindrance from man. We have no evidence the process has stopped.

Additional evidence remains to be gathered from archaeological material (see Wintemberg, *Can. Field-Nat.*, 33, p. 63-72). One of the most interesting finds would be remains of the large sea mink *Mustela macrodon* (Prentiss), of which we have no record for Nova Scotia. It is known from bones in the shell heaps of Maine and probably became extinct within historic times, as certain measurements and accounts of early skins are tentatively referred to this animal.

1. —Received for publication May 18, 1943.

NOTES AND OBSERVATIONS

GOLDEN EAGLE ON VANCOUVER ISLAND, B.C.—The Golden Eagle (*Aquila chrysaetos canadensis*) is not recorded for Vancouver Island in Bent's Life Histories (1937) *U.S. Nat Mus. Bull.* (16f) or in Brooks and Swarth's Distributional List of Birds of British Columbia, (1925) (*Pacific Coast Avifauna* No. 1f). The following occurrences given me by Mr. T. Wherry, taxidermist, Victoria, B.C., of birds that passed through his hands, are worth noting: fifteen or more years ago, two from Rithet's Farm, Victoria; a year later, one from Royal Oak, Victoria, (these localities are close to each other); twenty or more years ago one from Duncan; late summer of 1941, one from Thetis Island, (this is adjacent to Vancouver Island); two years ago one from Albert Head. These were all adult birds. Last November, 1942, a man brought Mr. Wherry wing feathers from an eagle shot at Beecher Bay; these showed the white bases to the feathers that proved the bird to have been an immature Golden; this man said it had an-

other with it. Mr. Wherry's recollection is that all these birds were received by him in the late summer or fall and after stormy weather.

These birds were taken in the southern, more populated portion of Vancouver Island, so that over the whole of Vancouver Island, it would seem likely that the Golden Eagle may be a fairly frequent visitant, possibly, a regular migrant.

In August, 1929, I saw an Eagle near Mt. Albert Edward that may have been a Golden; it showed no white on tail or head but was too far off to make out more, with the binoculars. Where seen the elevation would be 4500 feet and one would not expect to see a bald eagle (*Haliaeetus leucocephalus alascanus*) in the dark first year plumage there in August. Mt. Albert Edward and doubtless the other neighbouring peaks, would provide food for Golden Eagles in the shape of White-tailed Ptarmigan (*Lagopus leucurus*). —THEED PEARSE, Courtenay, Vancouver Island, B.C.

BIRD MOVES ITS EGGS TO NEW NEST. — Our Nighthawk (*Chordeiles minor*) is known to gradually move its eggs by pulling or pushing them under its breast each time it settles on them, and there is an unverified record of one carrying its eggs 200 feet in its mouth. Actual observations of birds moving their eggs are rare enough to notice a case from India. Major C. L. Boyle writes from Kashmir of a Pheasant-tailed Jacana that moved its four eggs some yards from the vicinity of his photographic blind to a newly constructed nest. Major Boyle saw the bird move the eggs over the marsh and writes, "Soon

she (the female bird) came to her eggs, crouched over them, and pressing one of them against her breast with her beak, but not lifting it, walked backwards over the lily leaves. Where there were no leaves the egg floated and it was soon safely manoeuvred into the new nest. She moved her other eggs in similar fashion." Incubation must have been advanced for the eggs to have floated. A photograph of the bird squatting down on the egg is shown (1942, *Jour. Soc. Preservation Fauna Empire*, new series, part XLVI, pp. 9, 10). A. L. RAND, National Museum Canada, Ottawa.

THE THREE PELAGES OF THE SMOKY SHREW—A study of my field notes made during a trip to Ricketts, Wyoming County, Pennsylvania, in autumn of 1927, reveals some items of possible interest to shrew collectors. These notes record the capture, on October 11, of a Smoky Shrew - "a young male, with fine unworn teeth, is in first pelage and measures 117, 47½, 13½". This specimen was a vealy, loose jointed young animal, whose skin, in spite of my best efforts, stretched to a string bean type of skin that stuck out like a sore

thumb in a series of well prepared adult skins. An interesting feature of this animal was the concolor buff appearance of its coat, quite unlike an adult female in dark brown summer coat, taken that same day, or a female, in lead colored winter coat, trapped the following day in a cold sphagnum bog.

None of the books in my library describe this juvenile coat of *Sorex fumeus fumeus*. Perhaps there is a fleeting and neglected autumnal period when the shrew collector must act quickly. —MORRIS M. GREEN, ARDMORE, PA.

NOTES AND OBSERVATIONS

THE ARCTIC CHAR AT NETTILLING LAKE, BAFFIN ISLAND, N.W.T.—In the *Canadian Field-Naturalist*, Vol. LVI, Nov.-Dec., 1942, page 129, T. H. Manning states that I did not obtain any Arctic Char, *Salvelinus alpinus* (Linnaeus) at Nettilling Lake, Baffin Island. It seems desirable to correct this impression. As a matter of fact, between May 10 and June 1, 1925, many medium-sized fish of this species were speared through holes in the ice at the mouth of Takuirbing River where it discharges into the eastern extremity of Nettilling Lake. The largest specimen secured was 22 inches long and weighed three pounds; a photographic negative of this individual is possessed by the National Museum of Canada. After the ice melted around the shores during

July and early August, many smaller examples were taken among the rocks in comparatively shallow water at various points in the eastern arm of Nettilling Lake. None was observed to the south, or west, when the lake was explored to its outlet at Koukdjuak River in late August and early September. Most of the above facts are given on page 116 of my publication, "A Faunal Investigation of Southern Baffin Island", *Bulletin No. 53, National Museum of Canada*, 1928. The occurrence of this char at Nettilling Lake is also mentioned in my report of Baffin Island fishes on page 132 of "Canada's Eastern Arctic", Department of Interior, Ottawa, 1935. —J. DEWEY SOPER, FORT GARRY, WINNIPEG, MANITOBA.

BANDED HERRING GULL No. 40-656624.—The following details relating to a banded Herring Gull (*Larus argentatus smithsonianus*) should be of interest to anyone concerned with problems of dispersal or other investigations involving the life history of this species.

Bird band No. 40-656624 was placed on a juvenile Herring Gull by me on one of the islands in the St. Augustine Bird Sanctuary, lying approximately in latitude 51, longitude 58, Saguenay County, Quebec, on August 1, 1942. This bird was "caught" on or about February 1, 1943, at a wharf in Tampico, approximately latitude 22, longitude 98, on the Gulf of Mexico, in the State of Tama-

lipas, Mexico. This provides one of the longest flight records available for banded individuals of this species. The man who caught the bird has been asked to release it with the band still in place, so we may again hear about this gull.

The St. Augustine Bird Sanctuary, in the Eastern part of Canadian Labrador, is one of the 10 important bird sanctuaries maintained by the Dominion Government along the North Shore of the Gulf of St. Lawrence in Saguenay County, Quebec, in which a widely varied population of sea-going birds, including eider ducks, are thriving under practical protective measures. —T. S. HENNESSY, National Parks Bureau, Ottawa.

BOOK REVIEW

LIVERWORTS OF SOUTHERN MICHIGAN; by William Campbell Steere; The Cranbrook Press, Bloomfield Hills, Mich., 1940; 97 pp., price, paper 50c; cloth \$1.00.

The preface to *Liverworts of Southern Michigan* admirably describes the nature of this small volume — "a relatively non-technical handbook designed for those who wish to learn to identify and to recognize at sight the commoner members of an interesting but often overlooked group of plants." It is very well planned and written, the style clear and simple, scientific terms being restricted to a minimum.

For the non-botanist are described the structure and reproduction of liverworts, their habitats, and methods for their collection, preservation and identification. A key to 43 genera and 58 species is followed by descriptions, a few of which are illustrated by means of excellent photographs, others by clear, careful line drawings. As many of the genera and species described have a wide distribution, in Canada as well as Southern Michigan and elsewhere in the United States, the handbook is a very useful one for any student of North American liverworts. P. SNURE.

BOOK REVIEW

SYSTEMATICS AND THE ORIGIN OF SPECIES FROM THE VIEW POINT OF A ZOOLOGIST. By Ernst Mayr, 8vo pp. XIV + 334, illus., Columbia University Press, New York, 1942. Price \$4.00 (U. S. A.), cloth.

There is almost endless variation in nature and the task of the taxonomist (or systematist) is to reduce it to a comprehensive system. The early stages of the study of a group is the sorting out and assigning of individuals to species, on morphological characters. In the study of birds and some other better known groups there has been a trend called the "New Systematics" (see *Can. Field-Nat.*, 56, 1942, p. 63 for review of Huxley's "The New Systematics"). In this the importance of the species is reduced, much of the work is done with infra-specific groups; and a biological rather than a purely morphological concept is used.

The present volume, with its wealth of examples from the whole field of zoology as well as Dr. Mayr's special field of birds, and its correlation of taxonomic results with ecological, geographical, and genetical viewpoints will aid not only in a better understanding of taxonomy but also of related experimental biology.

Practical aspects of taxonomy are touched on, such as: that the specialist can no longer depend entirely on random collections for his material; how identification and description is done; that the type is typical of nothing, but serves only to fix a name; and that populations and not individuals should be named. The taxonomist's terminology is idealized, and represents the facts as simpler than they really are. An understanding of this will save the non-taxonomist and the beginner in taxonomy much grief.

Individual variation is shown to occur in every population of animals and frequently foreshadows geographical variation. Populations within a species may show geographical variation in size, proportions, external structure, colour and pattern, internal structure, temperature tolerance, sexual dimorphism, molt, number of broods, nesting site, song habitat preference and migration. They differ in all the ways species differ from each other. These differences are genetic, the result of mutation and selection. Many subspecific differences may be grouped into certain classes of phenomena, as distribution of colour phases; adaptive colouration; correspondence

with ecological rules; and arrangement into clines.

Consideration of the differences between species shows they are sometimes less apparent than those between geographical races. Where actual intergradation occurs it is proof of subspecific status but island forms that are obviously geographical representations may not show intergradation. After considering various species definitions Mayr puts forward the following;

"A species consists of a group of populations which replace each other geographically or ecologically, and of which the neighboring ones intergrade or interbreed wherever they are in contact or which are potentially capable of doing so (with one or more of the populations) in those cases where contact is prevented by geographical or ecological barriers".

This including of geographical representatives, especially from islands or mountain tops that do not intergrade, into a larger, polytypic species has had an important effect in simplifying taxonomy. This is well shown by considering that in birds 19,000 species were recognized in 1910. Since then 8,000 forms have been described. Now the 27,000 forms are put in 8,500 species, a notable clarification of classification and less of a burden on memory.

There are certain border line cases of representative forms, for which no criteria are satisfactory; these are well considered as numbers of a super-species (an adaptation of the *Formenkreis* idea).

The process of evolution is demonstrated as starting with individual variation, passing through geographically isolated populations that, through mutation and selection, develop into subspecies and then species. These new species may then spread into the ranges of their closest relatives and live together.

The case for non-geographic speciation is considered, and the evidence for it found very scanty.

After a consideration of the geographical and biological barriers that separate species, and the trends of evolution in groups above species, the conclusion is put forth that the origin of higher categories, (families, etc.) is but a continuation of speciation. There is a bibliography of 16 pages.

This book will repay careful study by anyone interested in the variations of animals.

—A. L. RAND

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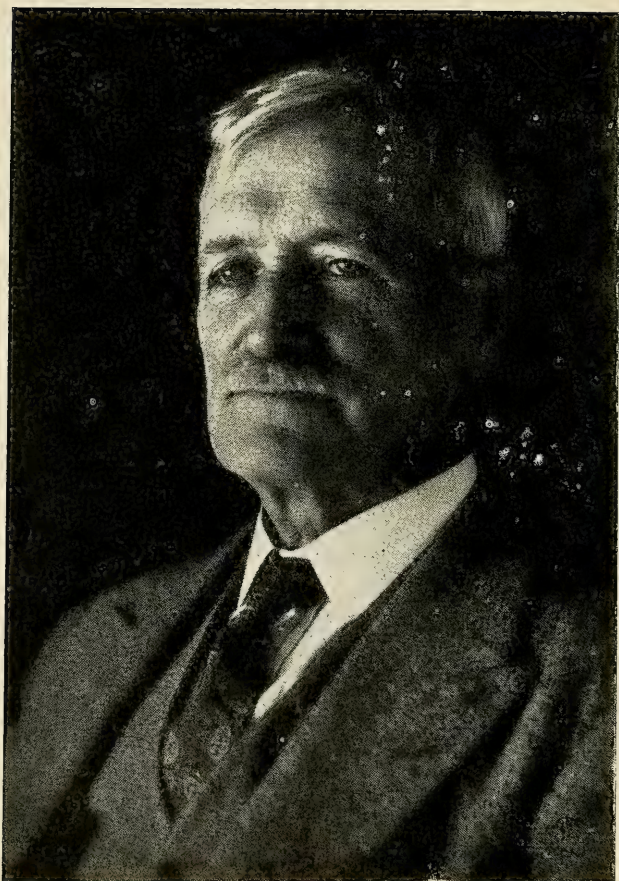
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1861 — 1943

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WILLIAM EDWIN SAUNDERS

1861 — 1943

35,343

By the late E. M. S. DALE

London, Ontario



TO BEGIN AN ARTICLE such as this with a "summary" may appear a bit odd, but the subject thereof was himself quite out of the ordinary, in many respects, and I feel that I cannot do better than quote the remark made by one of his best and oldest friends, "Well, we have lost Will" which seems to sum the whole matter up. Those who knew him best have lost a good and true friend, while the general public, in Western Ontario at least, have lost one who was an inspiration in all matters pertaining to Natural History through his column "Nature Week by Week" in the London Free Press.

Born in the city of London on August 16, 1861, William Edwin Saunders was a member of one of the most remarkable Canadian families, a family that has added immeasurably to the wealth of the world, not only financially through the introduction of Marquis wheat, but also culturally and scientifically in innumerable ways.

Dr. Saunders was educated in London Public Schools, Trinity College, Port Hope, and the Philadelphia College of Pharmacy of which he was gold medallist. On graduation he joined his father in the drug business and when his father separated the wholesale from the retail portion, William E. took over the wholesale end, remaining connected therewith until his death.

He was interested in the early days of the London Medical School, an affiliate of the University of Western Ontario, and was professor of Chemistry at the School from 1884 to 1889.

He was actively interested in many fields of science being a founder of the Ontario Entomological Society, the London Horticult-

ural Society, the London & Middlesex Historical Society, the McIlwraith Ornithological Club, the Federation of Ontario Naturalists, a member of the Ottawa Field-Naturalists' Club, a member of the council of the American Society of Mammalogists and a Fellow of the American Ornithologist's Union.

He married Emma, daughter of Dr. Hiram C. Lee, who survives him together with one daughter, Mrs. Muriel Fetherston, and three grand-daughters.

From early boyhood he was interested in practically everything out-doors although birds claimed the greater part of his attention. When he began bird study he had none of the modern aids, such as illustrated text books, pictorial magazines, motor cars, or even bicycles, while like spirits with whom he might associate or compare notes lived in distant cities. In those days a morning hike meant getting up long before daylight, footing it both ways, and after a tramp in the woods, (probably laden with a gun or other collecting paraphernalia), a return to the city where a long day's grind in the store awaited him. Fortunately the country was not as far from home as it is now and I have heard him recall getting over the snake fence at Lilley's Corners, (now the corner of Dundas and Adelaide Sts.) and getting lost in the woods.

One of his favorite sayings was "Never let the weather bluff you" and many an expedition has been started in the rain under the firm conviction that the sun would be shining at the other end of the journey. Nothing ever seemed to ruffle his even temperament. If a flat tire developed on a hot day with no shade in sight, if a sudden storm interrupted a picnic supper and made everybody scatter, if the motor went dead in a

terrific electrical storm in the middle of the night miles from anywhere (I have been with him on all such occasions) it was all part of the game.

His ornithological activities took him to all sections of Canada as well as the Eastern and Southern States. He made friends easily and had them everywhere so that on a trip of any extent it was unusual to find a place where he did not know some one. On journeys to Charleston, S.C. on two occasions our trip was punctuated by calls on various friends who went out of their way to make our stay ornithologically pleasant and profitable.

Although many of his specimens of birds and mammals were given to the Royal Ontario Museum of Zoology and the University of Western Ontario some years ago, he still retained a representative collection which included the only Canadian specimen of the worm-eating warbler, taken by himself, because "he heard a chipping sparrow singing where no chipping sparrow ought to be" and shot the bird to find out what it was. There were also many other rare birds including passenger pigeons shot by himself.

In 1936 the University of Western Ontario conferred upon him the degree of Doctor of Laws in recognition of his outstanding work

in Natural Science and his contribution to the life of the University and the whole community served by it, although he laughingly said it was because he went out into the country to sit around camp fires and eat burnt toast.

Dr. Saunders was deeply interested in flowers, especially iris, and during June his garden was a riot of color and the mecca of flower-lovers from far and near. He was ever generous with his treasures and many a garden is richer through having received from him not only pieces of iris but various bulbs and plants, to say nothing of advice on what to grow and how to grow it.

As one friend put it "he grew old gracefully" and although recent years showed a slight curtailment of his activities, he was rarely if ever sick and was quite active up to the first of February, 1943 when he was taken ill with pneumonia, and, although his life was despaired of, a rugged constitution built up by his out-door life, enabled him to weather the storm. Shortly after his recovery, however, he was again stricken and this time his reserve of strength was not sufficient to withstand the ravages of disease. He died June 28, 1943, and his place will be hard if not impossible to fill.

BOOK REVIEW

MEETING THE MAMMALS. By Victor H. Cahalane, with drawings by Walter A. Weber; The MacMillan Company, New York; 1943; 133 pp., price \$2.00 in Canada.

The mammals of the west are intimately bound up with its history, and with its present day attraction to the visitor. Highlights of a western trip are such things as the bears; elk; jack rabbits; a prairie dog town; or a coyote chorus.

Most people know little about mammals and this volume is intended to provide details of appearance and habits of the more common or conspicuous ones for the casual visitor to the western United States parks.

A brief introduction includes a defense of predators, a statement of park policy, and a warning against feeding bears. The body of the text consists of about 70 write-ups, some of species, some of groups in which species are not easily distinguished as bats, shrews and moles, giving habits, descriptions, and distinguishing characters. The style is rather

glib, with the object of attracting the non-technical reader; a park naturalist talking to a mixed group of tourists.

A few unfortunate phrases have crept in; as where it is said "with the exception of the hoofed animals, most mammals are small, secretive and more active by night", which ignores the bears, coyotes and cats; and where the impression is given that the red squirrel builds a pendant nest.

The illustrations, line or wash drawings for almost every write-up, scattered through the book provide an extremely attractive feature.

The book ends with a table of national parks and monuments and the more conspicuous mammals and where to see them in the parks; and a selected reading list from which E. Thompson-Seton is strangely absent.

On the inside front cover is an outline map of the United States showing the location of parks and monuments west of the Mississippi.

This is a book that will be carried by many tourists in the west and kept as a reminder of interesting things seen on their trip.

— A. L. RAND

A NEW LEMMING MOUSE (*Synaptomys*) from MANITOBA WITH NOTES ON SOME OTHER FORMS¹

By R. M. ANDERSON and A. L. RAND

National Museum of Canada

MEMBERS OF THE GENUS *Synaptomys*, distinguished from other meadow mice, voles and lemmings by their short tails, grooved incisors, and the deep re-entrant angles on only one side of the molars, are amongst the rarest of Canadian mammals in collections, especially the eastern forms of *Synaptomys borealis*, (subgenus *Mictomys*).

Howell reviewed the genus in 1927 (*North Amer. Fauna* No. 50) recognizing in Canada two species, *S. cooperi* with one form in Canada and *S. borealis* with seven forms. The difficulty in understanding the variation in *borealis* has been enhanced by the scarcity of material; both topotypical and from large areas separating localities of known occurrence. As special desiderata Howell mentioned material from eastern Canada; the area south and west of Hudson Bay, to Mackenzie and the Yukon; and southwestern British Columbia. The National Museum of Canada secured material from southwest British Columbia a number of years ago, proving to represent a new subspecies that Anderson (1933, *Ann. Rept.* 1931, *Nat. Mus. Can.*, p.104) described. We also have a series from Manitoba that proved to be another undescribed race, named in this paper.

The status of a number of forms still requires elucidation and material is needed, especially from the Mackenzie and Yukon Territories, and from Ungava and Labrador.

The following forms of this genus are recognizable in Canada:

| | |
|-----------------------------------|----------------|
| <i>Synaptomys cooperi cooperi</i> | Baird |
| " <i>borealis sphagnicola</i> | (Preble) |
| " " <i>medioximus</i> | (Bangs) |
| " " <i>innuitus</i> | (True) |
| " " <i>smithi</i> | new subspecies |
| " " <i>borealis</i> | Richardson |
| " " <i>chapmani</i> | Allen |
| " " <i>artemisiae</i> | Anderson |
| " " <i>wrangeli</i> | Merriam |
| " " <i>dalli</i> | Merriam |

The following includes the description of *smithi* and notes on some of the eastern forms of the genus.

We wish to acknowledge the loan of 10 specimens of *Synaptomys* from the Carnegie

Museum, through the kindness of Mr. J. Kenneth Douth, and four specimens from the private collection of J. Dewey Soper.

Synaptomys borealis smithi new subspecies

Type - No. 14815 National Museum of Canada; male adult; Thicket Portage, Mile 165, H.B. Ry., Manitoba; Aug. 3, 1936; Ronald Ward Smith; skin and skull in good condition.

Diagnosis: — A large form, much duller than *borealis*, *medioximus* and *innuitus*; much darker than *sphagnicola*.

General color dull, dark brownish, heavily mixed with black; slightly grayer anteriorly; whitish spots on hip glands of old males conspicuous; underparts plumbeous, fur tipped with silvery grey; tail bicolor; feet dusky.

Skull large; interorbital ridge long and sharp; rostrum somewhat long and narrow, tapering but little; bullae large; incisive foramen rather long and wide.

Measurements: — 3 adult males, Ilford and Thicket Portage: Total length 126, 128, 135 mm.; tail 24, 24, 27; hind foot 19, 19, 19.5. Skull basal length 24.25, 25, 25.25; zygomatic breadth 14.75, 16, 16; length rostrum 5.5, 6, 6.25; width rostrum 2.8, 3, 3.1; mastoid breadth 12, 12.25, 12.25; incisive foramina 5, 5, 5.2; length nasals 7.5, 7.5, 7.25; height of skull 9.7, 9.9, 10; (for comparative measurements of western forms see Anderson, 1933 *Ann. Rept. for 1931, Nat. Mus. Can.* p. 107).

Range: — We have specimens from Manitoba, from Ilford to Riding Mountain Park; one from Northern Saskatchewan; and northwestern Ontario specimens may prove to be referable to this form.

Remarks: — Our series of five adults from Manitoba is fairly uniform in pelage. In size of skull and amount of ridging there is more variation, suggesting the similar situation in *Microtus*. A specimen from Prince Albert National Park, Saskatchewan, is slightly brighter than Manitoba specimens, showing an approach to *borealis*, but is best included here. It measures, t.l., 118; t., 23; h.f. 17.5; skull basal length, 23.3; zygomatic breadth 14.8; (tip of rostrum broken); width rostrum 3; mastoid breadth, 12; incisive foramen 44.9; height of skull 9.2.

1. —Received for publication May 15, 1943.

In the large, high skull this new form is apparently different from *innuitus*; *medioximus* is richly coloured; *sphagnicola* about equals *smithi* in size, and while rather dull coloured is pale; *borealis* has a rich mahogany-hued pelage.

When Howell (op. cit.) monographed the lemming mice he had two Manitoba specimens that he included provisionally in *borealis*, though he noted that the skull of one of them was practically indistinguishable from the type of *innuitus* except for its slightly greater height, and suggested that additional material might show an undescribed race occupied this area. Our material shows this to be the case.

Besides the two Manitoba specimens Howell had records of specimens of the species *S. borealis* in Canada east of Alberta from but 5 localities, and it is advisable to list the additional records for this area that have accumulated at the National Museum in the 15 years since his monograph appeared.

Saskatchewan: — Besides the specimens listed below, Mr. Frank Banfield of Toronto (1941, *Can. Field-Nat.*, 55, p. 121) secured a specimen of *S. borealis* in the Prince Albert National Park; the first record for the province.

Manitoba: — Besides the specimens listed below, Morris M. Green (1930, *Can. Field-Nat.*, 44, p. 69) records taking two at Pine Falls in 1929, and a number at Cranberry Portage, Athapapuskow Lake, 50 miles north of the Pas.

Stuart Criddle of Treesbank, wrote the National Museum in 1930 that he took seven about 60 miles east south east of Winnipeg in 1929.

Ontario: — Recorded twice; Downing (1940, *Can. Field-Nat.*, 54, pp. 109, 110) reported one from Moosonee in 1939; Prince (1942, *Jour. Mammal.*, 23, p. 216) recorded another from Port Severn. Both were immature males and though from the descriptions given they appear rather pale, they are tentatively referred to this form.

The status of the species in western Quebec is unknown, as no specimens have been taken. Records for the species farther east are given under the appropriate subspecies headings. *Specimens examined* 1.

smithi. - MANITOBA, Ilford, Hudson Bay Railway, Mile 286, 4; Thicket Portage, 2; Cormor-

ant Lake, Hudson Bay Ry., Mile 42, 1; Clear Lake, Riding Mountain Park, 1; SASKATCHEWAN - west boundary Prince Albert National Park, 1²; Total 9 skulls, 7 skins.

borealis. - Wood Buffalo Park, 6; Peace River Landing, Alta., 1; Battle Lake, Alta., 4³; Total, 11 skins, 10 skulls.

innuitus. - QUEBEC, Fort Chimo, 1; Swampy Bay River, 1⁴; Ste. Marguerite River, 1⁴. Total, 3 specimens.

medioximus - LABRADOR, Nain, 4⁴.

sphagnicola. - Table Top Mountain, 3888 ft. alt., Gaspé, 1; near Bathurst, N.B., 1. Total 2 specimens.

Synaptomys borealis innuitus (True)

Type locality. — Fort Chimo, Quebec.

This race has been known only from the type, from alcohol. Cross (1938, *Journ. Mammal.*, 19, p.378) recorded a specimen from Godbout taken before 1918 that he suggests is closer to this form than to *medioximus* in skull and size of body. From long immersion in formaldehyde the color is unreliable, but is recorded as orange cinnamon.

A topotypical specimen of this race came to the National Museum through the Institute of Parasitology of MacDonald College, P.Q. It had been in formaldehyde for a short time. The relaxed hind foot measures 19 mm. The skull is badly broken but has a rostral length of 6 mm., rostral width of 3 mm., nasal length of 6.5 and incisive foramen of 4.5. The short rostrum is rather tapered, and the incisive foramen is wide. The color is rather bright yellowish brown anteriorly and reddish brown posteriorly, tail dusky above, whitish below; but the fur has been a short time in preservative.

From the Carnegie Museum we have one specimen, a ♂, taken at Rattogobass Lake, Swampy Bay River, less than 100 miles south of Chimo, taken by O. J. Murie on August 7, 1901.² It has no skull, but from the large, dark hind feet and the brighter colored tuft of hair at the base of the ears it seems to belong to the species *borealis*, and from the locality can be assumed to be this form. Its measurements (from label) are 110; 20; 20 mm. In color it is rather bright reddish brown above, clear grey below. It is slightly brighter than the Chimo specimen, and its general pelage is close to specimens of *cooperi* from Ste. Marguerite River. Another specimen

2. —J. Dewey Soper collection.

3. —3 of these, J. Dewey Soper collection.

4. —Carnegie Museum, Pittsburgh, collection.

1. —Specimens in National Museum of Canada unless otherwise specified.

a ♂ from 8th camp, Ste. Marguerite River, 9 June, 1917, O. J. Murie, measures 118; 25; 20 mm. Its skull is badly broken and the only measurement available is that of the nasals; 6.5 mm. In color it is less reddish brown, considerably paler and more greyish brown above and comes close in this to a specimen of *sphagnicola* from New Brunswick; the underparts are grey, tail dusky above, whitish below; however the short nasals make it advisable to refer it tentatively to *innuitus*.

Synaptomys borealis medioximus Bangs.

Type locality - L'Anse au Loup, Labrador.

From the Carnegie Museum we have four specimens taken at Nain, Labrador in August, 1901, by D. A. Atkinson.

Measurements. - T.l., ♂, 119 mm., 127, 135; ♀ 125; t. ♂, 23, 27, 25; ♀ 23; h.f. ♂ 20, 20, 20; ♀ 18; skull, basal length ♂ 22; ♀ 22.5; zygomatic breadth ♂ 13.8, 14.5; ♀ 15.1; length rostrum ♂ 5.6, 5.7; ♀ 6; width rostrum, ♂ 3, 3; ♀ 3.1; mastoid breadth ♂ 11.5, 12; ♀ 11.5; incisive foramina ♂, 4.2, 4.5; ♀, 5; length of nasals ♂ 6.5, 6.5; ♀ 6.8; height of skull, ♂, 8.5, 9; ♀ 9. The rostrum tapers but little.

On skull characters they differ from *sphagnicola* in the shorter rostrum and lower skull; with available material it is impossible to compare them with *innuitus*, but the rostrum is the same.

In color three are rather dark, rich brown, heavily mixed with black hairs above; tail dusky, paler below; underparts dark grey in two, washed with buffy; the fourth specimen, the largest, has much grey in the dorsal pelage, but incoming hair on the rump and back indicates it will attain a pelage similar to that of the others; underparts dark grey, without a buffy wash; tail dusky above, greyish below.

These are a much richer brown than *sphagnicola*, and much darker than our Swampy Bay River and our Chimo specimens of *innuitus*. Without more comparative material, it seems advisable to refer them to *medioximus* with the description of which they compare fairly well. This extends the known range north from Hamilton Inlet.

Synaptomys borealis sphagnicola (Preble)

Type locality. - near base of Mount Washington, New Hampshire.

Despite fairly extensive small mammal collecting in southeastern Quebec and the Maritime Provinces, that have included several expeditions from the National Museum, the only addition to the two locality records of

Howell (Ste. Rose, Temiscouata Co., Quebec and Gloucester County, N. B.), is the one for Gaspé by Anderson (1938, *Ann. Rept. Provancher Society, Quebec*, p. 80).

Synaptomys cooperi cooperi Baird

Type locality, - unknown.

Howell (op. cit.) maps the range of this form as from the northeast United States, into Canada from western Nova Scotia, west Gaspé, and Godbout west to Ontario just west of Lake Superior. Smith (1940, *Amer. Midl. Nat.*, 24, pp. 213-241, says that in Nova Scotia it is restricted to a few western counties.

Some additional information is available. In the National Museum we have a specimen from Cheticamp Lake, Victoria Co., Cape Breton Island, taken by Dr. R. M. Anderson in 1924, as well as a small series from Barrington Passage indicating it occurs throughout Nova Scotia. The range evidently includes all New Brunswick, as we have specimens from near Bathurst, St. Andrews, and Mt. Leonard (this last in Madawaska County).

For Quebec, Anderson (1938, *Ann. Rept. Provancher Soc., Prov. Que.*, p. 79) summarized the distribution as to Godbout, Ste. Rose, Lake Edward and Gatineau Valley. The Carnegie Museum has four specimens from the St. Margaret (or Marguerite) River that somewhat extends its known distribution to the northeast.

In Ontario there has been some extension of known range north to Lake Temagami in 1925 (Dr. Anderson examined a specimen from that locality, taken by M. M. Green, in the collection of the Academy of Natural Sciences, Philadelphia); Ridout (specimens collected by Soper in 1918, now in National Museum of Canada); Franz, (Saunders, 1927, *Jour. Mammal.*, 8, pp.305-307); Lake Nipigon (Dymond, 1928, *Trans. Roy. Can. Inst.*, 16, p.244) and Minaki (Green, 1930, *Can. Field-Nat.*, 44, p. 69).

Saunders (1932, *Trans. Roy. Can. Inst.*, 18, p. 296) quotes Snyder as recording this form from Lake Abitibi, but Mr. Snyder writes me this is an error.

In Manitoba it has been recorded from the extreme southeast at Pine Falls on the Winnipeg River by Green (l. c.).

June and July specimens from the Ste. Marguerite River (Carnegie Mus.); 2 May specimens from near Quebec City; and one April specimen from Bryantown, Ontario are somewhat brighter brown than August, September and October specimens from Ontario, New Brunswick and Nova Scotia, evidently a seasonal difference.

THE SWAMP CRICKET FROG, *Pseudacris nigrita triseriata*, IN CANADA¹

By E. B. S. LOGIER and G. C. TONER

Royal Ontario Museum of Zoology, Toronto

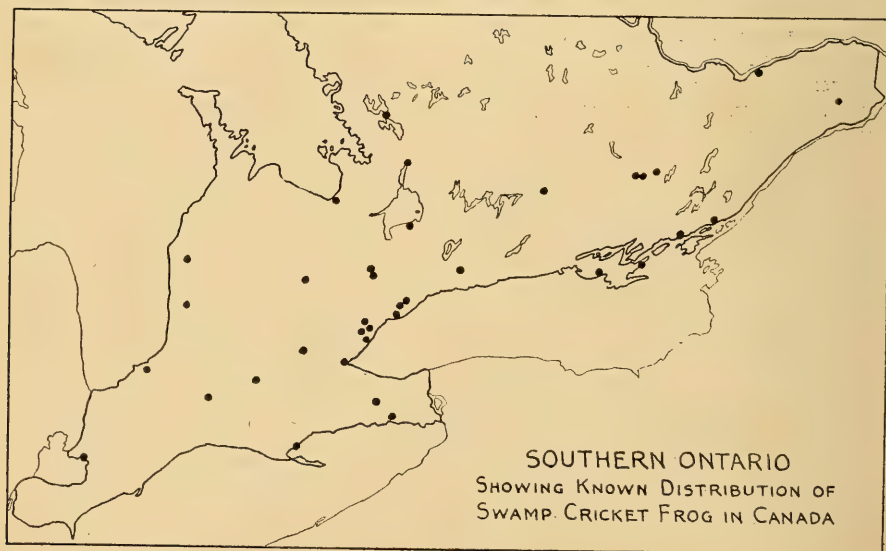
AS HAS BEEN MENTIONED before in this journal, Logier and Toner, *Can. Field-Nat.*, 56: 15, 1942; — *Ibid.*, 56: 126, 1942; a check list of amphibians and reptiles of Canada, Alaska and Newfoundland is in preparation. The work is progressing but the need for more information and specimens is apparent. Data on many of our commonest species, away from centers of population, is lacking and it is only through the cooperation of other naturalists that such data can be secured. With this in mind, we present herewith in condensed form our locality records to date from all sources for the above named species.

If any reader knowing of additional locality records not included in the following list would be kind enough to send such records, with as full data as possible, to the authors at the Royal Ontario Museum of Zoology at Toronto, the service would be greatly appreciated. In sending in a record, name the county, the township if known, and the town; or if taken at some distance from a town name the nearest town or post office and say how far from it, approximately, and in what direction. Give the name of the person who made the observation and state if the frogs

(or frog) were seen or only heard, and the date of the observation if known.

The list of localities follows, each of which is marked by a spot on the accompanying map of southern Ontario (we have no records from east of Ontario, or from north of a line drawn from Ottawa to Port Carling). *Bruce Co.* Lucknow; *Carleton Co.*, Ottawa; *Dufferin Co.*, Grand Valley; *Durham Co.*, Darlington Twp.; *Frontenac Co.*, Arden, Eagle Lake, Kingston, Mountain Grove; *Halton Co.*, Oakville, Sixteen Mile Creek north of Trafalgar; *Huron Co.*, Londesborough; *Kent Co.*, Big Point on Lake St. Clair; *Lambton Co.*, Thedford; *Leeds Co.*, Gananoque; *Lincoln Co.*, Warner; *Middlesex Co.*, London; *Muskoka Dist.*, Port Carling; *Norfolk Co.*, Turkey Point; *Ontario Co.*, Cooper's Falls; *Oxford Co.*, Woodstock; *Peel Co.*, Clarkson, Erindale; *Prince Edward Co.*, Hallowell, Cressy; *Stormont Co.*, Monkland; *Wentworth Co.*, Hamilton; *York Co.*, Agincourt, Black River at Lake Simcoe, Duncan, Leaside, Kelly Lake in King Twp., Pottageville, Toronto.

It should be noted that locality records are useful only when the identification of the species is known to be correct.



1. —Received for publication May 22, 1943.

The adult frogs are about 1 to 1¼ inches in length, and the disks on the fingers and toes are minute. There is a dark stripe along each side passing from the snout through the eye, and usually three dark stripes passing lengthwise down the back, but occasionally these are broken up or interrupted. The call is a vibrating chirp ascending in pitch, utter-

ed about from 24 to 48 times in a minute, depending on temperature.

Another subspecies, *P. n. septentrionalis* with shorter hind legs occurs in far northern and western Ontario, and westward. Records from north of the Upper Great Lakes might be referable to this form and should be accompanied by specimens for examination.

SOME RECENT LITERATURE

(Reviewed by A. L. RAND)

Two Pintails, one banded in California in 1933 and one in Kansas in 1937 are reported by the *Can. Nat. Resources Bull.* No. 268, June, 1942 as recovered on the Queen Maude Gulf area.

J. L. Peters has gone over the Canadian forms of the Sharp-tailed Sparrows, *Ammodramus caudacuta*; (1942, *Ann. Carnegie Mus.*, 29, pp. 201-210), and recognizes *subvirgata* Dwight the Acadian Sharp-tail occurring west to the lower St. Lawrence; the recently described *altera* Todd the James Bay Sharp-tail from James Bay that is most closely related to the Acadian Sharp-tail; and *nelsoni* J. A. Allen the Nelson's Sharp-tail that breeds from the southern Mackenzie and Alberta to Manitoba.

T. H. Manning gives a summary of some of his mammal notes from the west side of Hudson Bay in the *Can. Geog. Jour.* for 1942 (Vol. 26, pp. 84-105). Their relation to Eskimos is stressed. A shrew, species not given, is said to be rather rare at Repulse Bay.

J. A. Munro has an interesting article on the Trumpeter Swan in British Columbia in *Rod and Gun* (Vol. 44, pp. 6, 7 and 12, 13, 1943). It is estimated that some 500 of these birds wintered there in 1938-39, and probably nested there later. This represents about 75% of the Trumpeter Swan population. The only other populations of importance are in the Yellowstone National Park, Wyoming, and the Red Rock Lakes, Montana, totalling 148 birds at the last available census.

The Zoological Record for 1941, edited by Malcolm Smith (London, 1942) has just been received. W. L. Sclater arranged the bird and mammal entries. This is one of the "musts" for anyone doing research in zoology and the Zoological Society of London is to be commended for bringing it out in spite of the war. In the preface it is stated that the war has not appreciably affected the amount of zoological literature published; some 8,399 items are dealt with in this volume, an increase of 407 over the volume for 1940.

INSTRUCTIONS FOR PRESERVING ANIMAL SPECIMENS FOR SCIENTIFIC PURPOSES by R. M. Anderson, *National Museum of Canada, Ottawa, Special Contribution 43-2*, pp. 1-34, and 13 fig. 1943, (mimeographed).

Dr. Anderson's former publication on the subject was quickly exhausted, and this condensed set of instructions was prepared to meet a widespread need for information on how to preserve animal material for museum study. Bird, mammal, reptile and amphibian material is discussed. A very useful publication.

In the *Annual Report for 1941 of the Provancher Soc., Nat. Hist. of Can., Quebec*, Commandant Beange records a Bottle-nosed Whale near Cape Martin, and presents a series of drawings serving to identify whales and porpoises, and Dr. R. M. Anderson adds six mammals to the Quebec list; he describes two new races of red squirrels; reinstates an unrecognized race of meadow jumping mouse, reinstates an unrecognized race of woodland jumping mouse and describes two new woodland jumping mice; an unrecognized race of meadow jumping mouse from New Brunswick is also reinstated.

STATUS OF THE RICHARDSON VOLE (*Microtus richardsoni*) IN CANADA¹

By R. M. ANDERSON and A. L. RAND

National Museum of Canada

RICHARDSON VOLE of the west is the largest of the genus in Canada. It is approached in size only by the very different *M. xanthognathus* (Yellow-cheeked Vole). *M. richardsoni* is characterized by its large size; fairly long tail (for a *Microtus*); large feet; large, angular skull with spreading zygomatic arches; small audital bullae; and projecting incisors. Adult males have conspicuous side glands and several adult females in the collection of the National Museum of Canada also have the presence of side glands recorded on the labels. There is said to be a musk-bearing anal gland. Miller, 1896, *North Amer. Fauna*, No. 12, pp. 66f, considers this species as belonging to the subgenus *Arvicola* or Water Voles that is better represented in the old world than the new, where *richardsoni* is the only species. Bailey (1900, *North Amer. Fauna*, No. 17, p. 59) in his review of the genus followed this arrangement. But Ellerman, (1941, *The Families and Genera of Living Rodents*, p. 927), raises *Arvicola* to generic status to include only some thirty-three old world forms, placing *richardsoni* in *Microtus* where it appears to have no very close relatives.

In Canada the Richardson Vole occurs in the southern Rockies west to the Cascades where it lives about mountain streams, in forests and meadows, making burrows and runways. Their numbers may fluctuate violently and they can sometimes be extremely abundant (Racey and Cowan, 1936, *Prov. B.C. Report Prov. Museum for 1935*, p. 27). We have three pregnant females taken in July and August, with 7, 7, and 8 embryos. One of these had recently been nursing, indicating that broods may follow each other in rapid succession. Crowe (1943, *Bull. Amer. Mus. Nat. Hist.*, 80, p. 405) records a July immature carrying 4 embryos, indicating that this species breeds of an early age, as with *M. pennsylvanicus*, and that younger animals have smaller litters. Half-grown young in the collection taken in June and July indicate that breeding starts early.

Three subspecies of *richardsoni* must be considered in connection with Canadian popula-

tions: *richardsoni* DeKay from near Jasper House, Alta.; *macropus* Merriam from Pahsimeroi Mts., Idaho; and *arvicoloides* Rhoads from Lake Keechelus, Kittitas Co., Washington.

The form *arvicoloides* has been recorded from southwest British Columbia to Alta Lake (Racey and Cowan, l.c.) and specimens from the southern Canadian Rockies have been recorded as approaching *macropus* (Crowe, l.c.). Bailey (op. cit. p. 60) gave the range of *richardsoni* as restricted to the vicinity of Jasper and Henry House.

The National Museum of Canada has a good representation of this species from various parts of its range in Canada, including adults from Jasper Park, 5; Waterton Lake Park, 6; Rossland, 8; Hope-Princeton summit, 2; Lihumpton Park, 1; Mt. Cheam, 1; McGillivray Creek, 2.

Comparing the various specimens with the Jasper Park specimens (virtually topotypes) we cannot see any significant differences. The color difference between the series are less than differences within series, and there are no average differences.

The following are average measurements:

| | Total Length | Tail | Hind foot | Basal length of skull | Zygomatic breadth of skull |
|-----------------------------|--------------|------|-----------|-----------------------|----------------------------|
| Jasper | 248.8mm. | 74.2 | 27.9 | 33.1 | 21.8 |
| Waterton Lake .. | 238.2 | 66.3 | 27.8 | 33.2 | 21.6 |
| Rossland | 238.6 | 75.9 | 27.9 | 33.4 | 21.2 |
| Hope-Princeton Summit | 244 | 79 | 26. | 34.1 | 21.8 |
| Lihumpton | 248 | 78 | 30 | 34.25 | 22.5 |
| Mt. Cheam | | | | 34.5 | 21.75 |
| McGillivray Cr .. | 259.5 | 79.5 | 28 | 34 | 22.25 |

The race *macropus* is smaller; Davis (1939, *The Recent Mammals of Idaho*, p. 322, gives measurements as 215-67-27 mm., and states that extremely large individuals may measure 220-70-29.

Various skull and teeth characters are given as separating *richardsoni* from *macropus* and *arvicoloides*, which last two are similar in skull characters. None of our speci-

1. —Received for publication April 20, 1943.

mens differ appreciably in skull and teeth characters. It is worthy of note that some of our Jasper Park specimens have the characters given for *macropus* - *arvicoloides* to distinguish them from *richardsoni*; two of the four Jasper skulls have the posterior loop of the third upper molar recurved, one has the incisive foramen constricted posteriorly. In supraoccipital ridging, characters of nasals, and bullae there are no distinctive differences; in the projection of the incisors the Jasper Park specimens may average slightly more projection, but it is very slight.

The conclusion is that all our Canadian specimens must be referred to *Microtus richardsoni richardsoni* (DeKay). In Canada it ranges at high altitudes in Alberta and British Columbia from Waterton Lakes National Park west to the mountains above Chilliwack and north at least to Alta Lake in the Coast Range and Jasper National Park in the Rocky Mountains.

The above must not be construed as an opinion on the validity of either *macropus* or *arvicoloides*, of which we have seen no topotypical material.

NOTES AND OBSERVATIONS

AN APPARENTLY UNRECORDED FOOD OF THE RED SQUIRREL. — In winter in the Ottawa Valley, and doubtless elsewhere, the snow under white cedars (*Thuja occidentalis* L.) is often seen to be strewn with the tips of the tree's branches. These have been bitten off by red squirrels, (*Sciurus hudsonicus*) and their reason for doing so is at first glance not very clear. But close examination reveals that the squirrels have been eating the extremely small winter buds of the staminate flowers which are enclosed between the terminal pairs of the scale-like leaves. These buds form in the late autumn and pass the winter as minute black ovoid bodies, scarcely one millimeter in longest diameter. They resume growth so early in the spring that the flowers sometimes open and shed their pollen before the snow is all gone. In feeding on the buds, the squirrel nips off a spray, delicately bites out the tiny black buds without lacerating the enclosing leaves, and drops the spray to the ground. The varying hare eats cedar leaves, but evidently the red squirrel does not like them, and it is remarkable how neatly he removes the minute flower bud without biting into the surrounding foliage.

This seems to be an unrecorded food of the red squirrel. Klugh (Ecology of the Red Squirrel, *Jour. Mammal.* 8: 1, 1927) says the seeds of the white cedar are extensively eaten by squirrels; and Hatt, (The Red Squirrel, *Roosevelt Wild Life Annals*, 2: 1b, 1929) speaks of squirrels cutting off clusters of cedar cones for the seeds. But neither author mentions the flower buds in his list of squirrel foods; nor have I been able to find the buds recorded elsewhere as eaten by squirrels.

Cedars are so thickly leaved that the branchlets cut off by the squirrels, though often in considerable number, do not seem to harm the trees. If it were not for the litter on the ground, no one would know that the tree had lost any foliage. However, R. E. Balch, in *The Forestry Chronicle* (18: 1, March, 1942) describes damage to balsam fir and spruce in the maritime provinces by red squirrels cutting off shoots to feed on flower buds and foliage. As far as my observation goes, Ottawa Valley squirrels do not eat spruce or balsam flower buds. I have never noticed here shoots dropped by squirrels from trees of these species. —CHARLES MACNAMARA, Arnprior, Ontario.

EARLY ARRIVAL OF BRANT ON THE NORTH SHORE OF THE GULF OF ST. LAWRENCE — Mr. Georges Maloney, of Mingan, Saguenay County, Quebec, who is employed by the Department of Mines and Resources as Caretaker of Birch Islands Bird Sanctuary, which is situated about three miles south of Mingan, reports that on April 29, 1943, he saw

14 White-bellied Brant (*Branta bernicla hrota*) in the sanctuary. I know of no previous record of the arrival of this species on the north shore of the Gulf of St. Lawrence in April. The spring of 1943 was unusually cold and late at Mingan, as in north-eastern North America generally. — HARRISON F. LEWIS, Department of Mines and Resources, Ottawa.

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BOOK REVIEW

A SYNOPSIS OF THE RODENTS OF THE SOUTHERN PARTS OF THE PRAIRIE PROVINCES OF CANADA, by R. M. Anderson and A. L. Rand, *National Museum of Canada, Special Contribution* 43-1, pp. 1-25, fig. A-M, 1943 (mimeographed).

This brochure was prepared to provide basic information on rodents for an area

where they are of immense economic importance. It is concise and clear. The presentation by species, with subspecies discussed in subordinate headings, gives the layman a balanced conception of the prairie rodentia. The plan leaves plenty of room for enlargement. We would like to have a treatise on this plan dealing with all the mammals of Canada. It would be used daily. —C. H. D. CLARKE.

A NEW LIVE-TRAP FOR SMALL MAMMALS *

By R. F. MORRIS

*Dominion Entomological Laboratory, Fredericton, N. B.**See plate at end of this issue*

DURING THE PAST SEASON the writer was engaged in a study** of small forest mammals in Eastern Canada in relation to their value as a natural control factor for the European spruce sawfly. Since live-trapping was essential in this work in connection with population studies, it was desirable to have a simple but effective type of live-trap which could be easily constructed of inexpensive materials. Numerous types of live-traps have been devised for small mammals. None of the types examined by the writer, however, were found satisfactory for the purposes of the investigation; in some cases effectiveness was sacrificed for simplicity, while other types were too complicated, difficult and expensive to construct, or difficult to adjust under field conditions. Metal traps are liable to become too warm or too cold, and this results in a lower survival rate of captured specimens. Due to the presence of both shrews and rodents in most of the coniferous sites in Eastern Canada, a single catch trap was desirable since shrews usually kill mice or voles when they are caught in the same trap.

The accompanying photographs show the construction of the trap which was finally devised and used by the writer. One side has been removed to show the inside of the trap, and the top has been bent up slightly; actually the top board is level with the tops of the door and the back. A few pieces of $\frac{1}{2}$ " spruce board and some stiff galvanized wire are the essential materials for the construction of one of these traps. The floor board and the two side boards are made exactly alike; thus if an electric buzz saw is available large numbers of these pieces can be sawed out and grooved with a minimum of changes in the setting of the saw. The top board is the same width, but is somewhat shorter. The top and bottom pieces are nailed to the two sides. The door and the back are also alike and are cut to slide easily in the side grooves, with a certain amount of play to allow for shrinkage or expansion

caused by weather conditions. They also fit into grooves in the floor board so that the captive animal will have less chance of lifting them up. The construction of the trigger parts can be readily seen from the photographs. The trip-wire, which is suspended by a double-pointed tack in the top of the trap, has a crook in one end for engaging the trigger-wire, while the other end catches under a notch in the door. The trigger-wire is sharpened at one end to receive the bait (in this case a peanut) while the other end catches in the crook of the trip-wire. The trigger-wire is coiled around the cross-wire, on which it pivots. Small holes are drilled through the side boards to hold this cross-wire in position. The notch in the door may be reinforced by a narrow strip of metal to prevent it from becoming rounded off. For ventilation a 1" hole may be drilled in one side and covered on the inside by wire screening; in colder weather this hole can be easily plugged with a cork. The outside dimensions of this trap are 10" long by 5" high by $3\frac{3}{4}$ " wide, but it is possible that somewhat smaller dimensions could be used successfully. By the use of two large pack-sacks, one carried by shoulder straps and the other lying crosswise on top of it, 30 to 40 of the traps can be packed in one load.

Captured specimens are removed from the trap by lifting out the back and sliding the trigger-wire to one side. It is easy to renew the bait by turning the trigger-wire until it is pointing backwards. The trap can then be set and the back replaced. Some food should be provided at the back of the trap, and in cold weather cotton nesting material should also be provided. An important feature of this trap is the fact that the tension of the trigger pull can be easily adjusted by altering the angle of bend at the end of the trigger-wire where it engages the trip-wire. By simply bending the trigger-wire up or down at this point, the trap can be adjusted to have either a hair trigger or a slow trigger.

A considerable number of these traps was used during the season and found to be quite satisfactory for the White-footed Mouse, Red-backed Vole, Forest Meadow Vole, Jumping Mouse, and Short-tailed Shrew. No method has yet been found for live-trapping the Cin-

*—Contribution No. 2199. Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

**—Part of a doctorate thesis project, School of Forestry and Conservation, University of Michigan. See Morris, R. F. Preliminary notes on the natural control of Spruce Sawfly larvae by small mammals. *Can. Entomologist*, 74(11): 197-202, 1942.

ereous Shrew without high mortality. Since the trap was purposely designed to present only smooth wooden surfaces on the inside, damage to the spruce boards by gnawing is slight. Warping and splitting are not serious if proper care is taken in the selection of the wood. In stands where red squirrels

are numerous, they often spring or overturn the traps even though they are unable to enter them. This is an objection which it is difficult to overcome, and in stands where such interference is serious, it may be necessary for the trapper to remove the red squirrels by the use of a few larger traps.

VARIATION AND ABNORMALITY IN COMMON MILKWEED (*Asclepias syriaca* L.)^{1,2}

By HERBERT GROH

Division of Botany, Department of Agriculture, Ottawa

COMMON MILKWEED has a tendency to run to aberrations of one kind or another. Examples that have come to light in the course of many years acquaintance with it may serve, when presented here, to bring forward similar observations on the part of others.

SMOOTH FOLLICLES. *Asclepias syriaca* is distinguished from other species by the soft spinose processes borne on its follicles or "pods". This character is not constant but varies from quite echinate to perfectly smooth. Churchill (*Rhodora* 20: 206, 1918) regards the latter extreme as a distinct form to which he has given the name *inermis*. A count of seeds at the Division of Botany from pods smooth or echinate in greater or less degree yielded no clear evidence of biological difference. Nine smooth pods contained 1695 seeds, or an average of 188 each. Eleven echinate pods contained 2004 seeds, an average of 182, with variation not consistently in relation to degree of spinose covering. A note by the same recorder, W. G. Dore, dated Aug. 12, 1931, presents an observation of tropism, in that regardless of the position of a pod, spines regularly take a vertical position.

POLYPHYLLY. The occurrence of ternate or whorled leaves is not unusual. This was long since reported by Bicknell (*Bull. Torrey Bot. Club* 8: 139, 1889).

BIFURCATION OF LEAVES, petioles, pedicels and peduncles. Worsdell (*Principles of Plant Teratology* Vol 1: 217, 1915) states that "The bifid character of the leaf, indicating the first stage in the formation of two leaves from one is very common as an abnormality, especially in plants with an opposite decussate leaf arrangement". Twin follicles remaining fused would seem to be a reverse manifestation of the same. Various examples of the above have been encountered locally (see figure 1).

ALBINO FLOWERS. At Carleton Place, Ont., on July 9, 1927, and twice in the past season, pure white flowers were seen in the same field as normal purplish bloom. Albinism is not unusual in plants with purple or red flowers.

FOLIAR OUTGROWTHS (laminar enations and pitcher formations). Phenomena under this head are stated by Worsdell (l.c.) to represent an attempt on the part of the organ to reproduce itself. There is later evidence to indicate that some such manifestations, may be parasitic rather than genetic. Notice should also be taken of the occurrence of tubular leaves in *Dischidea*, an eastern tropical representative of the Asclepiadaceae. Without attempting any solution of the problem here, an excellent example of what is referred to may well be put on record. It can be so well illustrated by the accompanying photograph (figure 2) taken for the writer by J. B. MacCurry, then of this Division, that little description is required.

This rather bizarre specimen belonged to a colony discovered in a cornfield alongside the road which joins the Prescott Highway just before the Jock River crossing at "Heart's Desire". In 1928 numerous examples were localized within a limited area of a few square rods, indicating origin from one clone. Specimens transplanted for study lived for a time but yielded little new information and the parent colony was also lost after a year or two of other cropping of the field.

Constriction of the leaf blade or lamina, often entirely to the midrib, more or less crimping of the margins, and the tendency to asymmetrical "pitcher" formation at the tips are the peculiarities most in evidence. Normal green coloration and otherwise healthy appearance obtained. An instance somewhat similar, but without the "pitcher" leaf tips has been described and illustrated by Ludwig (*Proc. Ind. Acad. Sci.* 1921). Seedlings from these Indiana plants had normal leaves.

1. —Contribution No. 739 from the Division of Botany, and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

2. —Received for publication April 5, 1943.

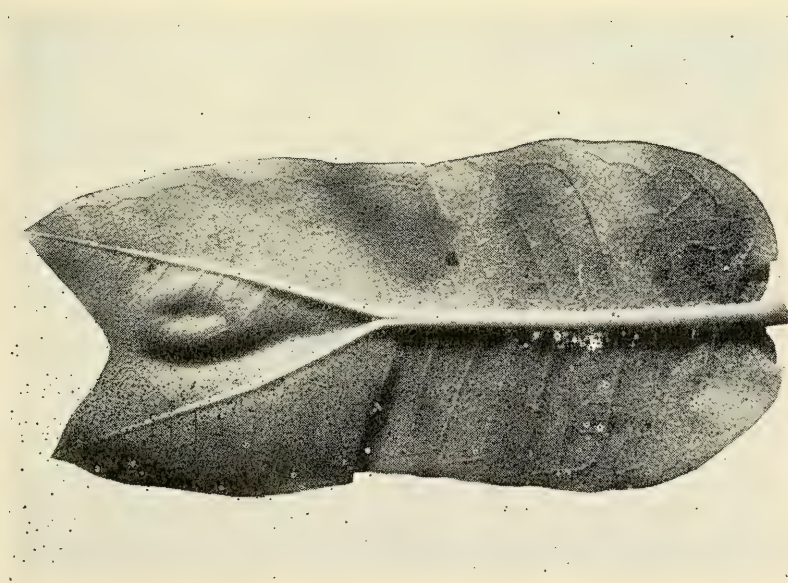


FIGURE 1. — Bifurcation of leaf of common milkweed. (*Asclepias syriaca* L.)

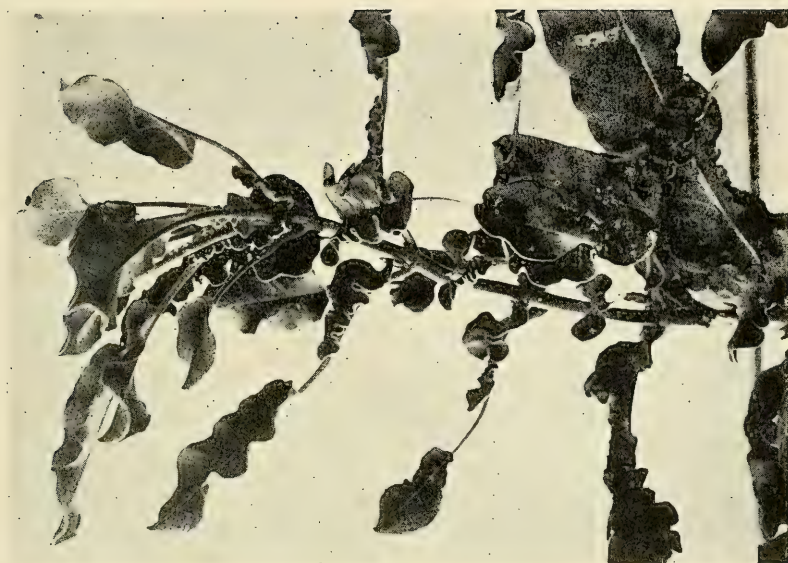
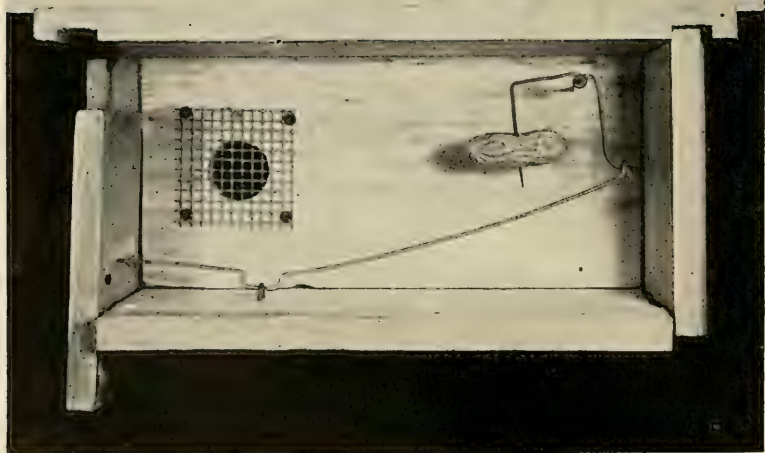
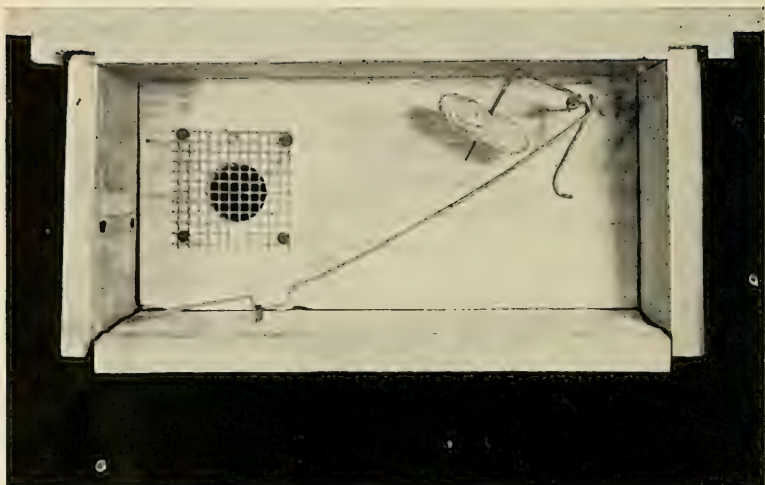


FIGURE 2 — Abnormal foliage of common milkweed (*Asclepias syriaca* L.).



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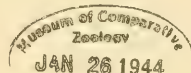
Nos. 7 and 8

CANADIAN FORMS OF THE MEADOW MOUSE (*Microtus pennsylvanicus*)¹

By A. L. RAND

National Museum of Canada

35,343



THIS IS A REVIEW of the nine races of the Meadow Mouse (also called Meadow Vole or Field Mouse, *Microtus pennsylvanicus*) that occur in Canada.

They are:

M. p. acadicus Bangs

ACADIAN MEADOW MOUSE

pennsylvanicus (Ord)

EASTERN MEADOW MOUSE

enixus Bangs

LABRADOR MEADOW MOUSE

labradorius Bailey

UNGAVA MEADOW MOUSE

fontigenus Bangs

QUEBEC MEADOW MOUSE

drummondi (Aud. and Bach.)

DRUMMOND MEADOW MOUSE

aphorodermus Preble

BARREN GROUND MEADOW MOUSE

insperatus J. A. Allen BEAN OR

BADLANDS MEADOW MOUSE

modestus (Baird)

SAWATCH MEADOW MOUSE

The Meadow Mouse belongs to a group that is widespread in the northern hemisphere of the old and the new world, but this species is American only. Wide ranging in the United States, it occurs over most of Canada excepting the northern part of Keewatin, northeast Mackenzie District, the Arctic islands, and the coastal area of British Columbia.

Bailey in his monograph on the voles of the genus *Microtus* (1900, *North American Fauna*, No. 17) recognized seven of the nine forms dealt with here. In 1902 Preble (*North American Fauna*, No. 22, p. 53) described

another of them, *aphorodermus*, from the Keewatin District, and in 1920 Bailey described the other *wahema*, from Montana and it was soon found to occur in the prairies of southern Canada, but Allen's name *insperatus* antedates it. Dale in 1940 (*Jour. Mammal.*, 21, pp. 332-340) reviewed the British Columbia mice of this species and recognized four races in the province, describing two new forms *rubidus* and *funebrius*, and re-instating an old name *microcephalus* of Rhoads, but our material does not substantiate this treatment.

Of the nine subspecies recognized here, Bailey considered two, *enixus* and *drummondi* as separate species, and Preble described *aphorodermus* as a species. The form *drummondi* was soon considered a subspecies as Bailey's description had indicated it was. Anderson in 1937 (in *Canada's Western Northland*, Ottawa) considered *aphorodermus* a subspecies of *pennsylvanicus*, and the original description had indicated that this was the case. The form *enixus*, was shown to be of subspecific rank by Davis in 1936 (*Jour. Mammal.*, 17:290).

Microtus pennsylvanicus has been held up as an example of an animal that does not conform to the rule that animals from the northern part of the range of the species are larger than those from the southern part, and this has been correlated with its tunneling or burrowing habits. However the case is not as simple as that. The northern race *drummondi* is smaller than such southern races as *pennsylvanicus* and *modestus*. But within the population included in *drummondi* those from the lower Mackenzie are larger than those from the more southern Wood Buffalo Park. The race *aphorodermus* from Keewatin is considerably larger than *drummondi* that

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occurs in Manitoba to the south. The race *enixus* is not smaller than the more southern *pennsylvanicus*, though the still more northern *labradorius* is smaller. Thus it seems that in part this species decreases in size northward, and in part it increases in size.

In working out the status of the forms of this vole, a number of difficulties presented themselves. Color seems to be a good character for *acadicus* and *insperatus*, but the seasonal range of color in *drummondi*, due to moult and wear, is great as shown by our excellent series from Wood Buffalo Park, (see under *drummondi*). When it is considered that moult may occur at different times of the year in different places, and frequently a specimen is much greyer or redder than the rest of a series taken at the same time and place, and that many localities are represented by but a few specimens from a single month, it is seen that color must be used with care in separating races.

The question of when the mice of this species reach their full size is a difficult one. Breeding evidence is of no value, as the females can breed at the age of 25 days (Bailey, 1924, *Journ. Agr. Research*, 27, p. 528). Whether or not the skull is ridged is apparently an age character, but there is some geographical variation in this, *modestus* apparently exhibiting this in its highest development. It becomes necessary to judge whether or not lack of ridging is an age or a geographical character. The race *fontigenus* was considered to have a smooth skull, until additional specimens showed that adults have ridged skulls.

Though adults from one locality may be more or less uniform in size, occasional exceptions occur, as in specimens of *drummondi* from Wood Buffalo Park; one has a length of 183 mm. while the next largest has a length of 159 mm. (see under *drummondi*). A. B. Howell (1923, *Jour. Mammal.*, 4, pp. 35, 36) has suggested that the size reached by voles may vary from year to year.

There is sometimes considerable variation in the relative length and breadth of the brain case. Young skulls, in addition to lacking the ridges of the adults, also show other differences. The skull is more arched, the nasals are relatively shorter, and there is a tendency toward a less complex molar enamel pattern.

Frequently the larger part of a series is of young animals. This perhaps is correlated

with their short life span of 18-22 months (Hamilton, 1942, *Amer. Naturalist*, 76, pp. 216-218). Rarely is a series almost entirely adult, as in the Grand Manan series. These factors make measurements unsatisfactory for comparison.

In the following I have listed all the material with skulls I have examined. But for one reason or another, including factors such as age or broken skulls, it has been impossible to identify every individual. The identifications are of populations. In the very nature of subspecies that overlap through intergradation or individual variation this must be so.

Where one subspecies intergrades into another, the populations do not always smoothly intergrade, but there may be examples that are closer to one form, others that are closer to the other, as well as intermediates. This is shown by our specimens of *enixus* and *labradorius* from Ungava; by *insperatus* and *drummondi* from the southern prairies; by *drummondi* and *aphorodermus* from Churchill. Snyder (1938 reprint from *Trans. Roy. Can. Inst.*, XXII, p. 175) reports a similar condition in the western Rainy River area of Ontario, where *drummondi* and *pennsylvanicus* intergrade.

To Dr. R.M. Anderson I am indebted for the opportunity of discussing with him problems that arose in the preparation of this paper. The Carnegie Museum of Pittsburg, through Mr. J. Kenneth Doult, kindly loaned material from the Labrador Peninsula, and the Royal Ontario Museum of Zoology, through Mr. Stuart C. Downing, material from northwestern Ontario, and I wish to express my thanks to these institutions and gentlemen.

Microtus pennsylvanicus acadicus Bangs

ACADIAN MEADOW MOUSE

Microtus pennsylvanicus acadicus Bangs, 1897, *Amer. Nat.*, XXXI, pp. 239, 240. - Digby, Nova Scotia.

Diagnosis — The pale coat, with a yellowish or clay colored tinge in both the brownish summer and the greyer winter pelage is the most distinctive character.

Measurements — Specimens from various parts of Nova Scotia: total length (10) 172-184 (av. 177.2 mm.); tail (10) 43-57 (av. 50.3); hind foot (10) 19-23 (av. 22.0); skull, basal length (10) 24-26.5 (av. 25.07); zygomatic breadth (10) 14.5-16 (av. 15.15).

Grand Manan: t.l. (10) 168-194 (av. 188.6); t. (10) 41-51 (av. 49.9); h.f. (10) 23-24 (av. 23.8); skull, b.l. (7) 25-27.5 (av. 26.4); z. b. (7) 15-17 (av. 15.9).

Distribution. — Nova Scotia, Prince Edward Island, Grand Manan Island, and probably southern New Brunswick.

Remarks. — Occasional specimens in a series of *pennsylvanicus* from Bathurst show an approach to this form. We have no adequate material from Prince Edward Island but Bailey (1900, p. 19) examined 40 specimens from there and reported that they exhibited the characters of this race in an accentuated degree. The Grand Manan specimens, while very similar in color to Nova Scotia specimens are somewhat larger (see measurements). The large size of Grand Manan specimens has already been commented on by Copeland and Church (1906, *Proc. Biol. Soc. Wash.*, 19, pp. 121-126). This suggests that an island race may be separable, but it is inadvisable to name it until adequate material is available from southern New Brunswick.

Material examined. — NOVA SCOTIA: Shelburne Co., 22; Annapolis Co., 14; Kings Co., 8; Guysborough Co., 4; Victoria Co., 30; Inverness Co., 3. PRINCE EDWARD ISLAND: Mt Herbert, 2. NEW BRUNSWICK: Grand Manan, 19. Total 102 specimens.

Microtus pennsylvanicus pennsylvanicus (Ord)
EASTERN MEADOW MOUSE

Mus pennsylvanicus Ord, 1815, *Guthrie's Geography*, 2nd American edition, II, p. 292. — Meadows below Philadelphia, Pennsylvania.

Diagnosis. — Distinguished from *acadicus* by being somewhat darker in color, brownish replacing yellowish tinge in the pelage.

Measurements. — Northern New Brunswick: total length (10) 169-195 (av. 182.5 mm.); tail (10) 54-65 (av. 61.5); hind foot (10) 21.4-24 (av. 22.5); skull, basal length (10) 24.5-26.5 (av. 25.7); zygomatic breadth (10) 14.5-16 (15.4).

Pancake Bay, Ontario: t.l. (6) 160-189 (av. 169); t. (6) 40-55 (av. 46.8); h.f. (6) 21-22 (av. 21.3); skull, b.l. (6) 24-26 (av. 25.2); z.b. (6) 14-15.2 (av. 14.7).

Distribution. — Northeastern United States, north New Brunswick, Quebec south of the St. Lawrence River, including Gaspé, southern Ontario north to Ottawa, Algonquin

Park, Nipissing and the east end of Lake Superior; west of the Great Lakes it intergrades with *drummondi* on the southern edges of Manitoba and southwestern Ontario.

Remarks. — The relationship with *acadicus* is shown by the series from near Bathurst, northeast New Brunswick, of which a few specimens show an approach to *acadicus* in color. Gaspé specimens have usually been referred to *fontigenus* though Goodwin (1929, *Jour. Mammal.*, 10, p. 223, 224) considers them not typical and our specimens are better referred to *pennsylvanicus*. In the northwest part of the range in Canada this species intergrades with *fontigenus* as is shown by our Ottawa specimens. Miller (1897, *Proc. Boston Soc. Nat. Hist.*, 28, pp. 14, 15) records this form at North Bay. That this form becomes smaller in the western part of its Canadian range, as also does *fontigenus*, is shown by the Pancake Bay (Lake Superior) specimens (see measurements above). Although some of the specimens from the Rainy River area (Snyder, 1938, reprint from *Trans. Roy. Can. Inst.*, XXII, pp. 174-175) and our extreme southern Manitoba material shows that occasional specimens referable to *pennsylvanicus* occur, most of the material is closer to *drummondi* and these are evidently areas of intergradation between *pennsylvanicus* from the south and *drummondi* from the north.

Material examined. — NEW BRUNSWICK: Charlotte Co., 2; Victoria Co., 1; York Co., 1; Madawaska Co., 18; Gloucester Co., 43. QUEBEC: Gaspé Peninsula, 13; Bonaventure Island, 1; St. Lambert, 1 (approaching *fontigenus*); Hatley, 1. ONTARIO: Dundas Co., 3; Carleton Co., 25; Frontenac Co., 5; Peterborough Co., 1; York Co., 15; Halton Co., 1; Waterloo Co., 6; Middlesex Co., 1; Elgin Co., 5; Essex Co., 7; Algonquin Park, 5; Sudbury District, 3; Algoma District (Pancake Bay) 21. PENNSYLVANIA: Ardmore, 3; (nearly topotypical). NEW JERSEY: Ocean Co., 2; CONNECTICUT: Cos-cob, 1. Total 182 specimens.

Microtus pennsylvanicus enixus Bangs
LABRADOR MEADOW MOUSE

Microtus enixus Bangs, 1896, *Amer. Nat.*, XXX, pp. 1051, 1052. — Hamilton Inlet (North Shore), Labrador.

Diagnosis. — Distinguished from *pennsylvanicus* and *acadicus* by the darker summer pelage; by the average slightly lighter molars; by the average larger, longer and wider

incisive foramen; and by the skull being flatter and less arched.

Measurements. — Hamilton Inlet (5 adults): total length 163-195 (av. 182.2 mm.); tail 51-64 (av. 58.6); hind foot 21-22 (av. 21.6); skull, basal length 24.75-27.00 (av. 26.10); zygomatic breadth 15-16.75 (av. 16.05). Charlton Island, James Bay: skull b.l. 25.5, 25.5, 26.5; z.b. 15.5, 15.75, 15.75.

Distribution. — Across the Ungava Peninsula from James Bay to Hamilton Inlet and Hebron, Labrador.

Remarks. — Windsor and Nain specimens compare well with Hamilton Inlet specimens, as do the three adults from Charlton Island; two Davis Inlet specimens show the protruding incisors of *labradorius*, apparently bridging the gap between the two forms by individual variation. A Hebron specimen shows some approach to *labradorius* but is closer to *enixus*. Except for the three Charlton Island specimens the material from the east side of James Bay is too poor for comparison but none of them have the projecting incisors of *labradorius* and presumably are this form. Some specimens from Richmond Gulf have projecting incisors, others do not, suggesting intergrading between the two forms in this area.

This form was described as a species, and Bailey in his monograph of 1900 considered it a distinct, well marked species. Davis in 1936 (*Jour. Mammal.*, 17, pp. 290, 291) showed that *enixus* was a race of *pennsylvanicus*. Comparison of the five adults from Hamilton River with series of other races shows that the differences are relative, and through individual variation overlap with other forms. The flattened skull indicates relationship with *labradorius*, the range of size in the audital bullae overlaps that in *fontigenus*. The characters separating it from *pennsylvanicus* are only average and Bailey in 1900 pointed out it was close to this form. The most important reasons for considering it a species were its relationship with *labradorius* that are discussed under the next form.

Enixus was described as a large form and so considered by Bailey (*op. cit.*, p. 24) with a total length of 189.4 mm. The measurements of the present material are not dissimilar. But Davis (*l.c.*) gives its size as small; total length 152.1 mm., tail 46.8 and hind foot 21.6, averaged from 10 topotypical specimens. Howell's suggestion (*l.c.*) as to the

possibility of these mice reaching a different size in different years comes to mind.

Material examined. — LABRADOR: Hamilton River, 5; Windsor, 2; Nain, 5 (all Carnegie Museum), and Davis Inlet, 2 (approaching *labradorius*); Hebron, 2 (1 Carnegie Museum). QUEBEC: Charlton Island, 9; near Cape Jones, 1; Fort George, 2; Cape Hope Islands, 1.

Microtus pennsylvanicus labradorius Bailey
UNGAVA MEADOW MOUSE

Microtus pennsylvanicus labradorius Bailey, 1898, *Proc. Biol. Soc. Wash.*, XII, p. 88. — Fort Chimo.

Diagnosis. — Distinguished from *enixus* by the more projecting upper incisors, the shorter, less projecting nasals, and the slightly smaller incisive foramen, a tendency toward an interior point on the first upper molar, and slightly smaller size.

Measurements. — Ungava Bay: Two skins apparently adults, have the following measurements: total length 167, 167; tail 46, 50; hind foot, 21, 21; skull measurements of adults are: basal length (4) 25-26.5 (av. 26.38); zygomatic breadth (5) 15-16.5 (av. 15.9).

Distribution. — Northern Ungava from Port Burwell, Hudson Strait, westward and south to Great Whale River, on east side of Hudson Bay. Its extension inland is unknown.

Remarks. — Our material shows that this form reaches a larger size than Bailey (*op. cit.* p. 22) indicated.

Comparison of seven adults of *labradorius* from Ungava Bay with the five adults of *enixus* from Hamilton River shows that the differences between these forms is less than has been supposed. The projection of the incisors of *labradorius* is the most prominent character, and in this the Ungava Bay series shows some variation, but they do not fall into two series, nor do they suggest that both *enixus* and *labradorius* are represented. Rather it suggests that this character is relative, and there is an approach to overlap by individual variation.

The three (of 12) Chimo specimens that Bailey (*l.c.*) referred to *enixus*, and the two of my specimens with projecting incisors from Davis Inlet mentioned under *enixus* also allow of this interpretation.

Our material from the east side of Hudson Bay is mostly poor, with skulls badly broken, but two from Great Whale River and one

from Richmond Gulf have the protruding incisors of this form, while two from Richmond Gulf and one from Second River have this character less pronounced, indicating intergrading with *enixus* in this area.

Material examined. — QUEBEC: Port Burwell, 2; George River, 1; Chimo, 13 (4 of these Carnegie Museum coll.); Mouth Koksoak River, 3 (Carnegie Mus. coll.); Port Harrison, 1; Richmond Gulf, 3; Great Whale River, 2; Second River, 1. Total 26 specimens.

Microtus pennsylvanicus fontigenus (Bangs)

QUEBEC MEADOW MOUSE

Microtus fontigenus Bangs, 1896, *Proc. Biol. Soc. Wash.*, X, pp. 48, 49. — Lake Edward, Quebec.

Diagnosis. — Distinguished from *labradorius* by the less flattened, more arched skull, by the incisors not projecting, the nasals not being shortened, by the slightly heavier molars, the audital bullae being slightly larger, and by the lesser tendency for the development of an inner posterior point on the first upper molar.

From *pennsylvanicus* (and *acadicus*) very lightly distinguished by the darker pelage, the average more slender rostrum, and the average larger audital bullae.

Measurements. — Lake Edward: total length, 150-158 mm.; tail 45, 45.5; hind foot 20.5, 21.5; skull, basal length, 25.5; zygomatic breadth 15.5. Labelle Co.: t.l. (10) 180-192 (av. 186.5 mm.); t. (10) 42-56 (av. 49.3); h.f. (10) 20-24 (av. 21.6); skull, b.l. (8) 25-27 (av. 26.1); z.b. (8) 14.75-16 (av. 15.5). Moisie Bay specimens are slightly smaller, and in all apparently adult specimens the total length is 160-183.

Distribution. — Quebec, north of the St. Lawrence from Natashkwan, Saguenay County, westward to Gatineau County, and across Ontario north of the range of *pennsylvanicus* to the north shore of Lake Superior. The northern limits of the range remain to be worked

out.

Remarks. — This is a lightly differentiated form, intergrading with *pennsylvanicus*, *enixus*, and *drummondi*.

That it is not a small form is shown by the Labelle Co. specimens; the skull is ridged even in one of our Lake Edward topotypes.

Moisie Bay and Natashkwan specimens are slightly greyer and smaller than Labelle County specimens; Snyder records this form from Lake Abitibi (1928, *Univ. of Toronto Studies, Biol. Series* No. 32, p. 12 of reprint); Miller records it from the north shore of Lake Superior (1897, *Proc. Boston Soc. Nat. Hist.*, pp. 14, 15), and Dymond records it from Lake Nipigon (1928, *Trans. Royal Can. Inst.*, 16, p. 245). Apparently there is a progressive diminution in size westward in Ontario until specimens are referable to *drummondi*.

Material examined. — QUEBEC: Natashkwan, 8; Havre St. Pierre, 2; Moisie Bay, 12; Lake Edward, 2; near Quebec City, 2; Labelle County, 77; Gatineau Co., 14. ONTARIO: Kapuskasing, 2. Total 119 specimens.

Microtus pennsylvanicus drummondi

(Audubon and Bachman)

DRUMMOND MEADOW MOUSE

Arvicola drummondi Audubon and Bachman, 1854, *Quad. N. Am.*, III, pp. 166, 167. - Rocky Mountains, vicinity of Jasper House, Alta.

Diagnosis. — Distinguished from the above forms by its smaller size, and from all but *fontigenus* by the larger audital bullae; otherwise the skull is very like that of *pennsylvanicus*.

Measurements. — Jasper Park, Alberta: total length, (7) 140-163 mm. (av. 147.1); tail, (7) 33-45 (av. 36); hind foot, (7) 18-19.5 (av. 18.7); skull, basal length, (7) 23-24.5 (av. 23.6); zygomatic breadth, (7) 13.75-14.75 (av. 14.1).

ADDITIONAL MEASUREMENTS (mm.)

| | External Measurements | | | | Skull | | |
|---|-----------------------|--------------|------|-----------|-----------------|--------------|-------------------|
| | Number Measured | total length | tail | hind foot | Number Measured | basal length | zygomatic breadth |
| Jasper Park | 7 | 147.1 | 36 | 18.7 | 7 | 23.6 | 14.1 |
| Mt. Brilliant, B. C. | 4 | 156.5 | 41.8 | 20 | 6 | 24.9 | 14.6 |
| Atlin, B. C. | 7 | 155.8 | 44.5 | 19.1 | 7 | 23.5 | 14.2 |
| Wood Buffalo Park | 10 | 149.7 | 42.2 | 19.8 | 10 | 24 | 14.1 |
| Fort Rae ¹ | 10 | 169.5 | 44.6 | 19.3 | | | |
| Aklavik | | | | | 2 | 24.5 | 14 |
| North Manitoba Churchill, Ilford, Thicket Portage | 10 | 164 | 50.9 | 18.9 | 10 | 24.7 | 14.3 |
| N. W. Ontario Fort Severn | 10 | 162.7 | 42.3 | 19.9 | 8 | 24.5 | 14.5 |
| Lake Attawapiskat | 4 | 153.8 | 43.8 | 19 | 4 | 23.8 | 14.5 |
| S. W. Ontario Rainy River ² | 23 | 169 | 43 | 19 | | | |
| Thunder Bay | 7 | 158.1 | 45 | 19.7 | 3 | 24.5 | 14.5 |
| South Sask. (Lost Mt. and McDonald Lakes) | 10 | 163 | 43 | 19.6 | | | |

1. —From Preble 1909, *No. Amer. Fauna*, No. 27, p. 187.2. —Snyder, 1938, *Trans. Royal Can. Inst.*, XXII, p.175.

That considerable variation in size occurs in a population is shown by a single Wood Buffalo Park specimen that measures t.l. 183 mm.; t. 52; h.f. 20; skull, b.l. 25.25; z.b. 14.5, while the next largest has a length of 159 mm., and the next ten average 149.7 mm. in length.

Distribution in Canada. — British Columbia, at Crow's Nest Pass and north from Jasper and the mountains above Bella Coola, to the mouth of the Mackenzie, eastward to Churchill and Fort Albany, and southward to Lake Attawapiskat, Thunder Bay, Rainy River and southern Manitoba, and all Saskatchewan, except the extreme southwest, and all Alberta except the extreme southeast.

Remarks. — This race, as here understood includes a number of populations that differ considerably from topotypical material. To lump them all together is admittedly unsatisfactory, but seems preferable to naming or

recognizing races on characters that may later prove due to intergrading with other races or to seasonal pelages.

A series of fifty specimens from Wood Buffalo Park (north Alberta and south Mackenzie) distributed over the year from March to October shows the great seasonal change in pelage that may occur. Four July specimens are very dark and blackish; eleven August specimens are more yellowish; thirteen September specimens are much greyer, evidently molting into winter pelage; six October specimens are in long, dense winter pelage with a pronounced yellowish grey appearance; twelve March and April specimens are similar, but somewhat more reddish brown, probably the result of wear; the four June specimens are molting into dark summer pelage. Occasional specimens are much greyer or redder than the majority of specimens.

With the possibility in mind that moult may occur at different times in different places, and the fact that various series, while differing from each other, represent populations of which we have samples from but a single season, it seems advisable to use color of coat with care in recognizing races.

The Wood Buffalo Park specimens are slightly darker than comparable specimens from Jasper Park; Wisteria and Hazelton specimens (central British Columbia, May-Aug.) are similar to Jasper Park specimens. An Atlin series is very slightly redder (*rubidus* of Dale, 1940, *Jour. Mammal.*, 21, p. 339); a series from Mt. Brilliant (central British Columbia) is dark compared with Jasper material, and slightly larger. They evidently represent intergradation with *modestus*. Racey and Cowan (1926 *Rept. Prov. Museum for 1925, Province of B. C.*, p. 22) record this form near Alta Lake. Aklavik winter specimens are much like Wood Buffalo winter specimens in pelage. They have slightly more projecting incisors than more southern animals, suggesting an approach to the condition in *labradorius*. Preble (1908, *North Amer. Fauna*, No. 27, p. 187) pointed out that northern Mackenzie specimens are large, especially Fort Rae material; these he considers as intergrading with *aphorodemus*. Bailey (1900, *N. Amer. Fauna*, No. 17, p. 23), had already commented on the large size of these north-western animals.

In northern Manitoba *drummondi* intergrades with *aphorodemus*; (Preble, 1902, *North Amer. Fauna*, No. 22, p. 52, and National Museum of Canada material from Churchill); toward the east it intergrades with *fontigenus*, as shown by the large size of material from this area. Specimens from Fort Albany, James Bay are referable to *drummondi*; farther east, Charlton Island specimens are referable to *enicus* and intergradation with that form may occur.

In southern Manitoba *drummondi* intergrades with *pennsylvanicus* (Bailey, 1926, *North Amer. Fauna*, No. 46, p. 93) and we have some specimens from as far south as Turtle Mts., that are typical *drummondi*, as well as larger specimens. Eastward into southwestern Ontario *drummondi* intergrades with *pennsylvanicus* (Snyder, 1938, *Trans. Roy. Can. Inst.*, XXII, pp. 174, 175 for the western Rainy River area).

In southern Saskatchewan the National Museum material shows *drummondi* extends to Big Muddy Lake, McDonald Lake on the Souris River and Last Mountain Lake, though

slightly larger; and intergrades with the pale *insperatus* in the Cypress Hills area and southward. In southern Alberta it intergrades with *insperatus* in the vicinity of Eagle Butte and Lodge Creek. For the larger size of this mixed population see under *insperatus*. Specimens from the Waterton Lakes Park are slightly greyer than more northern animals, but are definitely *drummondi*.

Thus we have a wide distribution, with considerable variation, correlated in part at least with intergradation with related forms. *Drummondi* intergrades with at least five other subspecies. Until recently *drummondi* often has been listed as a species, though in 1900 (*N. Amer. Fauna*, No. 17, p. 23) Bailey showed its characters were only relative, and in 1920 (*Jour. Mammal.*, 1, p. 71) treated it as a subspecies of *pennsylvanicus* as had Hollister in 1913 (*Can. Alpine Jour.*, Special No. p. 23).

Material examined. — ONTARIO: Fort Albany, 10; Lake Attawapiskat (Kenora Dist.) 41; Fort Severn, 121; Favorable Lake (Kenora Dist.), 41; Thunder Bay (Lake Superior), 11. MANITOBA: Norway House, 6; Churchill, 27; Herchmer, (H. B. Ry., Mi. 412), 1; Bird, (H. B. Ry. Mi. 349), 2; Ilford (H. B. Ry. Mi. 286), 4; Thicket Portage (H. B. Ry., Mi. 165), 6; Cormorant Lake (H. B. Ry., Mi. 42), 2; Wasagaming, 4; Norwood, 1; Brandon, 1; Shoal Lake, 1; Oak Lake, 2; Riding Mountain Park, 1; Swan River, 1; Junction Antler, 1; Max Lake (Turtle Mountain), 4. SASKATCHEWAN: Indian Head, 7; Glen Ewen, 7; Big Muddy Lake, 1; McDonald Lake, 17; Watrous, 1; (specimens from the extreme southwest of the province show intergrading with *insperatus*, and are listed under that form). ALBERTA: Athabaska Lake, 1; Lac la Nonne, 2; Belvedere, 1; Edmonton, 1; Jasper, 46; Little Sandhill Creek, Red River, 1; Bearberry Creek, near Sundre, 13; Dried Meat Lake, 2; Mountain Park, 6; Islay, 3; Banff, 4; Waterton Lakes Park, 7; (specimens from the extreme southeast of the province, intergrading with *insperatus* are listed under that form). WOOD BUFFALO PARK, (Alta. and Mackenzie Dist.), 45. BRITISH COLUMBIA: Vanderhoof, 1; Hazelton, 3; Wisteria, 11; Mt. Brilliant, Rainbow Mts., 20; Atlin, 7; Crow's Nest Pass, 1. YUKON: Teslin Lake, 15. MACKENZIE DISTRICT: Fort Simpson, 1; Fort Good Hope, 1; Aklavik, 4; Crystal Island, Artillery Lake, 1; Thelon River, 2. Total 324 specimens.

1. —Specimens from Royal Ontario Museum of Zoology.

Microtus pennsylvanicus aphorodemus Preble
BARREN GROUND MEADOW MOUSE

Microtus aphorodemus Preble, 1902, *No. Amer. Fauna*, No. 22, p. 53 - near mouth of Thewiaza River, Keewatin.

Diagnosis.—Like *drummondi* but larger; skull heavier; rostrum proportionately heavier; color dark yellowish bistre as in *drummondi* usually with an admixture of yellowish tipped hairs imparting a coarse, grizzled appearance (from original description).

Measurements. — (average of 6 adults from the type locality), total length, 182 mm.; tail, 49; hind foot, 20.3; skull of type, basal length 28; zygomatic breadth 16.5 (Preble l.c.).

Distribution. — Probably the barren grounds of Keewatin District, known from the type locality, and known to intergrade with *drummondi* at Churchill, Manitoba.

Remarks. — Though described as a species, the original description indicated the subspecific relationship with *drummondi*, and Anderson (1937, in *Canada's Western Northland*, King's Printer, Ottawa), considers it a race of *pennsylvanicus*. Preble (l.c.) records that Fort Rae specimens show an approach to this form, though still referable to *drummondi*. Nine of our considerable series from Churchill show an approach to this form, and might be considered as belonging to this race.

Material examined. — MANITOBA; Churchill, 9.

Microtus pennsylvanicus insperatus J.A. Allen
BADLANDS MEADOW MOUSE;
BEAN MEADOW MOUSE

Microtus insperatus J.A. Allen, 1894, *Bull. Amer. Mus. Nat. Hist.*, 6, p. 347. - Custer Black Hills, South Dakota.

Diagnosis. — Differs from *pennsylvanicus* in the slightly smaller size; from *drummondi* by larger size; and average proportionally smaller audital bullae; differs from both of the above in the pelage being paler and greyer.

Measurements. — Type, total length, 178 mm.; tail, 43; hind foot, 20; skull, basal length, 27; zygomatic breadth, 15.4 (from original description). Adults from the Cypress Hills and Eagle Butte area of Saskatchewan and Alberta, t.l. (10) 160-185 (av. 171.7); t., (10) 41-54 (av. 47.8); h.f., (10) 20-21.5 (av. 20.9); skull, b.l., (8) 24-26.75 (av. 25.5); z.b., (8) 14-15.25 (av. 15.1).

Distribution. — Extends from the United States into extreme southwestern Saskatchewan and extreme southeastern Alberta, intergrading with *drummondi* over most of its range in Canada.

Remarks. — Anderson, 1943, *Can. Field-Nat.*, 57, p. 92 has shown that *insperatus* rather than *wahema* Bailey is the name for this form. Two specimens from Sweet Grass Hills, Alberta, are grey and plainly referred to this race (identified as *wahema*, not typical by Bailey). From the other localities listed below the material shows some grey pelaged specimens approaching *insperatus*, some brown pelaged specimens approaching *drummondi*, and intermediates. Some of the greyer specimens have been identified as *wahema*, not typical, while some of the browner pelaged specimens have been identified as *drummondi* not typical, by Vernon Bailey. Greene (1926, *Can. Field-Nat.*, 40, pp. 142, 143) recorded this form from Swift Current.

Material examined. — MONTANA: Glendive, 1. ALBERTA: Eagle Butte, 8; Sweet Grass Hills, 2; Milk River, 2; Lodge River, 6. SASKATCHEWAN: Cypress Hills, 11; Battle Creek, 3; Crane Lake, 2; Valmarie, 2; Eastend, 6; Lonesome Butte, 14. Total 57 specimens.

Microtus pennsylvanicus modestus (Baird)
SAWATCH MEADOW MOUSE

Arvicola modestus Baird, 1857, *Mamm. N. Amer.*, 1 p. 535, 536. - Cochetopa (Sawatch) Pass, Colorado.

Diagnosis. — Old specimens have more heavily ridged skulls than have other forms; differs from *drummondi*, the only form with which it comes in contact in Canada in its larger size, and relatively narrower skull; similar to *pennsylvanicus* and *fontigenus*, but has more abruptly down turned nasals, and is darker than the former, and with average larger bullae.

Measurements. — Newgate, total length (7) 161-174 (av. 168 mm.); tail, (7) 44-51 (av. 45); hind foot, (7) 20-21 (av. 20.8); skull, basal length, (7) 25.25-26.25 (av. 25.6); zygomatic breadth, (7) 14.5-15.75 (av. 15.0). Princeton-Keremeos area: t.l. (7) 165-180 (av. 174.6); t. (7) 45-53 (av. 49.1); h.f. (7) 19-21 (av. 20.1); skull, b.l. (3) 25.75-27 (av. 26.2); z.b. (3) 15.5-16 (av. 15.8).

Distribution. — Extends from the United States into southern British Columbia east of the Cascades, north at least to Lake

Windermere, intergrading northward with *drummondii*.

Remarks. — Dale (1940, *Jour. Mammal.*, 21, pp. 332-340) has recognized two races of this species in south British Columbia, *microcephalus* and *funnebris*, both larger than *drummondii*. Neither are distinguished in the descriptions from *modestus*, though under *funnebris* it is said that in its large size and dark color it approaches specimens of *modestus* from southern Idaho. I have seen no topotypical *modestus* but in 1931 Dr. Anderson went into the question of the identity of the south British Columbia meadow mice, and has allowed me to use his notes made at the time. In the U.S. National Museum he compared a large series from the Okanagan, Columbia and Kootenay valleys with 53 topotypical *modestus*, and could see little difference between them. Crowe (1943, *Bull. Amer. Mus. Nat. Hist.*, 80, p. 404) says that a series of 26 specimens from Invermere (Lake Windermere) are typical of the race [*modestus*] to the south in all respects.

Comparing a series of more than 40 skins from Creston, Newgate and Yahk, which I assume are the same form as Cranbrook skins that Dale includes in *microcephalus*, with about 45 skins from the Princeton-Hedley area; 23 from Rossland, two specimens from Penticton, and 16 from Pend d'Oreille River that

should be in part at least *funnebris*, I cannot separate them on color characters, and in size it seems that this form reaches its extreme size in Canada in the southwest part of its range here, and decreases in size westward and over a wide area northward. Dale lists Anahim Lake measurements as (av. 16 specimens) t.l. 150.4; t. 41.5; skull, b.l. 26.7; z.b. 14.9. My specimens from nearby Mt. Brilliant are considerably smaller, and I have included them in *drummondii*. Dale's Indian-point Lake specimens are also small, (average 9 specimens) t.l. 144; t. 39; skull, b.l., 25.7; z.b. 14, evidently intergrading with *drummondii*.

There is considerable variation in the size and color of populations represented in our material, that I tried unsuccessfully to correlate with altitude. Rather it appears that many individual populations in this area have slightly different characters of less than taxonomically useful value.

Material examined. — BRITISH COLUMBIA: Princeton, 12; Hope-Princeton summit, 3; Hedley, 10; Fairview Summit, 4; Fairview-Keremeos Summit, 9; Penticton, 2; Oliver, 2; Westbridge, 7; Mouth Salmon River, 1; Rossland, 23; Creston, 14; Erickson, 1; Pend d'Oreille, 16; Yahk, 7; Goatfell, 2; Newgate, 16; Morrissey, 2; McGillivray Creek, 1.

A NEW GENUS OF CONULARIDS¹

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THE FOSSIL SPECIES *Conularia loculata* Wiman (1894, *Geol. Inst. Uppsala*, Bull. 2, p. 113) is distinguished from other conularids by its small size, smooth surface, and slender, bifid internal septa. For shells of this type the new generic name *Eoconularia* is

proposed, with *Eoconularia loculata* (Wiman) as genotype. Wiman's species was from the Silurian of the Island of Gotland. A new species which seems to be congeneric has been found in the Trenton at Ottawa, and a form from the Upper Ordovician at Toronto, also new, is being referred to the genus with some doubt.

¹ Received for publication September 17, 1943.

RELATION BETWEEN FISH AND FISH-EATING BIRDS¹

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INTRODUCTION

THE NAME 'fish-eating birds', as commonly understood, implies a menace to legitimate sport or an encroachment upon the feed supply of mankind" (Cottam and Uhler, 1936, p. 1). Although this name is very appropriate, as the main bulk of birds' diet consists of aquatic organisms, the interpretation of damage done by them is very often greatly confused. It is not sufficient to ascertain the presence of game fish in birds' stomachs; it is also necessary to establish definitely how frequently this type of food is eaten and under what circumstances. In other words, it is most important to find out *how often* and *where* the bird feeds *regularly*, before condemning it as "public enemy no. 1".

On the other hand, one should not forget that angling is becoming a very popular sport, and consequently there is a great "rod pressure" on fishing waters, especially on those located along the good roads. Hewitt (1936, p. 11) was perfectly right, when he said that "the argument that trout were numerous when the streams were wild in early times and that the birds were plentiful does not count for much because in those times anglers were not taking the bulk of the production of the streams and the birds could have what the anglers now take and make no serious inroads".

DIFFERENCE IN OPINIONS

All those who are concerned with the problem of fish-eating birds may be divided into three categories: *ultra-preservationists*, often members of the Audubon Society (Pough, 1936); *extreme opponents*, generally fish culturists (Culler, 1936) or members of the Izaak Walton league; and finally the minority, who take the *middle course* (Munro and Clemens, 1937; Hubbs and Eschmeyer, 1938).

Those who try at any cost to protect even the most destructive species of birds and animals are, of course, fully justified in their aim. It is really alarming, how many different animals have been exterminated by man

intentionally or unintentionally during recent centuries. According to Harper (1938), during the Christian era the world has lost by extinction 72 forms of mammals, and some 350 or 400 others may be considered vanishing also. There must be at least 100 forms of birds which have also become extinct.²

Lumley (1935, p. 5) presented a vivid picture of the recent disappearance of several species of birds, many of which lived in enormous flocks on this continent. He wrote that "North America in 1844 witnessed the extinction of the Great Auk; in 1875 the last of the Labrador Duck; in 1890 the disappearance of the Carolina Paroquet; in 1914 the end of the Passenger Pigeon.....and in 1932 the only surviving Heath Hen died".

On the other hand, one can easily understand the sentiment of those advocating severe control against fish-eating birds, as there is sufficient evidence of the destruction of many valuable game fish by these predators.³

Regardless of the point of view on fish-eating birds, all should agree, that the facts of predation should be thoroughly studied and carefully interpreted, before *predator problems* can be properly or definitely solved. How complicated these problems are can be seen from the great number of different questions which arise even in an attempt to enumerate them (Hubbs and Eschmeyer, 1938, p. 165).

WHICH GAME FISH ARE DESIRABLE SPECIES?

This seemingly simple question is often hard to answer with precision. The feeding habits of fishes are primarily responsible for this complexity. For instance, some of the more desirable species including the Basses, Maskinonge, Doré or Yellow Pickerel, etc., are themselves predators or cannibalistic. "Even the very small and weak fishes are to some degree predators on the very young

2.—This statement is credited to Prof. V. C. Wynne-Edwards of McGill University.

3.—For the meaning of predation, see Errington (1937). Methods of predator control around hatcheries and rearing ponds are described by Lagler (1939).

1.—Received for publication December 26, 1942.

game and pan fishes. In fact, almost all of our fresh-water fishes are carnivorous, preying either on other fishes or on their food organisms. This almost complete lack of herbivores among our fishes is one factor which tends to make fish management more difficult than game management" (Hubbs and Eschmeyer, 1938, p. 165).

Food interrelations between different species of the Salmon family are particularly interesting in connection with the above thesis.

1. *British Islands*

In British waters an excellent game and pan fish, the Grayling, is often considered vermin, on account of its habit of eating Brown Trout eggs. In this connection, Platts (1930, p. 88) stated that "surely there is no British freshwater fish which is at once regarded with such enthusiastic affection and intense hatred as the Grayling. His status in the trout stream is one of the bewildering uncertainty whether he is going to be tenderly cherished as a sporting acquisition or summarily kicked out as an unmitigated hooligan."

Equally it is hard to call gamey Brown Trout an undesirable species. However, in British rivers containing the Atlantic Salmon the interests of these two species are rather conflicting. According to the experience of Armistead (1920, pp. 189-192), "it is not possible to cultivate both in any water with unqualified success. To make the most of the fishing in any river or lake it is necessary to decide whether trout or salmon are to be fostered.....There seems little doubt that a salmon river should be as free from trout as possible, and that it is hardly possible to maintain a really good stock of trout where salmon parr are numerous".

2. *North America*

Among famed game fishes from Eastern North America, the Speckled Trout is very destructive to another, even more important sport species, the Atlantic Salmon (White, 1939, p. 10).

Along the Pacific Coast, there are five species of salmon belonging to the genus *Oncorhynchus*. Three of these: Sockeye, Pink and Chum are prized as valuable food fishes, while the Spring and Coho are important from both a commercial and a sport point of view. Among them, Coho is a very voracious fish, attacking other salmon, and so is con-

sidered as a dangerous predator on other more valuable species.

Gamey Cutthroat Trout and particularly Dolly Varden Char are also sworn enemies of young salmon, and consequently in Alaska the United States Government is paying a bounty for killing Dolly Vardens (Hubbs, 1940). Within British Columbia, Coho, trout and char are considered regular predators feeding extensively on young Sockeye in Cultus Lake (Ricker, 1941) or on Pink in McMillan Creek, Masset Inlet (Pritchard, 1936).

Many more similar examples can easily be cited. However, these suffice to illustrate the point that it is not always easy to define which fish may be called a "desirable species". Their importance not only varies from place to place, but also depends upon the preference of individual fishermen.

ABUNDANCE OF FISH IN NATURE IS CHECKED BY SEVERAL FACTORS

There are several external or environmental⁴ causes why fresh-water fishes, in general very prolific, are not found in great numbers everywhere. A few examples may be cited.

1. *Meteorological and thermal causes*

a. Sudden freshets or continuous droughts may reduce fish population considerably.

b. During the cold months of the year in several lakes oxygen becomes deficient, thus causing "winter-kill" (Hubbs and Eschmeyer, 1938, p. 143).

c. Even lightning in some cases may be the cause of death to fish population (Raney, 1941).

2. *Pollution and erosion*

a. Industrial wastes and domestic sewage often cause great damage to fish (Ellis, 1937; Hubbs and Eschmeyer, 1938).

b. Erosion and silting may damage or destroy spawning facilities and reduce production of fish food (Smith, 1940; Sumner and Smith, 1941; Ward, 1938).

3. *Enemies and diseases*

a. In addition to fish-eating birds, fish have a great many other animal predators, some of which are terrestrial and some aquatic in habits. The long list of these enemies may be found, for instance, in the publications

4. —Internal or hereditary characteristics of fishes, such as size limit, reproductive capacity, immunity, etc., will not be discussed here.

by the following authors: Armistead (1920, pp. 68-81), Hewitt (1931, pp. 93-108), Hubbs and Eschmeyer (1938, pp. 164-168), Markewitsch (1934, pp. 1-67), Mottram (1928, pp. 99-110), Needham (1940, pp. 73-75, Platts (1930, pp. 76-96), and many others.

b. Among plants, there are also fish enemies. Apart from fungi (*Achlya* and *Saprolegnia*), for instance, barbed seeds of "Wild Sunflower" (*Bidens cernua*) may cause considerable damage among young trout (Huntsman, 1932). Newly hatched fishes often become entangled and die in the fine meshes of certain algae, as *Hydrodictyon reticulatum* (Markewitsch, 1934, pp. 64-67).

c. Numerous diseases yearly take considerable toll of fish. Descriptions of these diseases and fish parasites are given in numerous publications. Davis (1934), for instance, summarized information on Speckled Trout.

FISH-EATING BIRDS IN FRESH-WATER HABITATS

Fish-eating birds of North America, according to their habitats, may be broadly divided into marine and fresh-water.

A great many species are found in fresh-water areas, but only those, which have a direct relation to game fish, will be considered here. They may be arbitrarily separated into three groups.

1. *Scavengers*

As an example may be cited the Herring gull (*Larus argentatus*). Although this species is more commonly found around large bodies of water, it inhabits several inland lakes. Within the Laurentides Park in Quebec, for instance, the Herring gull is a common sight around the lakes. In spite of its typical scavenging habits, it also feeds on live fishes. The present author found many bones of Speckled Trout near its nesting colonies within the Park.

A few Herring Gulls, which inhabit individual lakes, do not cause any appreciable damage to the local fish. On the contrary, the esthetic value of gulls is many times more important than trout eaten.

2. *Waders or shore feeders*

Great Blue Heron (*Ardea herodias*) and American Bittern (*Botaurus lentiginosus*) are typical representatives of this category. Their food consists in part of fish and in part of terrestrial animals found around shore (Cottam and Uhler, 1936, pp. 6-7).

These birds may cause considerable destruction around hatcheries and rearing ponds (Carman, 1936; Hewitt, 1931 and 1936; Hoover, 1936). On the other hand, in open waters inhabited even by trout or salmon, they do not cause any great damage to game fishes (White, 1939a). When they feed around warmer lakes, they consume chiefly abundant shore species, among which are the stunted populations of sunfishes or the like. So they may actually be helping to increase the desired species (Hubbs and Eschmeyer, 1938, p. 167).

Being a solitary and wary bird, the Heron is often difficult to observe. Its flight by leisurely wing strokes is a pleasant and impressive sight.

3. *Divers or real "fish-eaters"*

Several birds, expert in catching fish, belong to this category. Some of them, as the Kingfisher and Osprey, dive from the wing, while others, as Mergansers, Golden-eye, Loon, etc., swim under the water. The Mergansers according to Beach (1937), may travel as far as two hundred feet under water and the Common Loon probably even farther.

a. The Osprey or Fish Hawk (*Pandion haliaëtus*) may cause some damage in hatchery fish ponds (Bowden, 1936), otherwise in the wilds it is one of the most picturesque birds (Lumley, 1935; Edge and Lumley, 1940).

b. The Common Loons (*Gavia immer*) frequent the northern lakes of Canada, where their long, loud laugh in the evenings is very characteristic. Usually only one pair nest around a lake of the smaller sort. Loons feed on any fish and very often on Speckled Trout. Damage done by these predators during the summer, is, however, rather negligible, on account of the small number of birds present in each locality.

c. Golden-eyes, or Whistlers (*Glaucionetta clangula*) are game birds. According to several authors (Leonard and Shetter, 1937, p. 335; Pirnie, 1935, pp. 311-312; White, 1939a, p. 9), these ducks occasionally feed on fish, but aquatic insects and crayfish make up the bulk of their diet. The experience of the present author showed also that they feed almost exclusively on larvae of the Caddisfly and on crayfish.

The present knowledge of the feeding habits of the Golden-eyes shows quite clearly that these ducks are not very partial to fish. They

may, of course compete somewhat with game fishes by eating the same food, but the excellent game qualities of these birds amply compensates for this damage.

d. Kingfisher (*Megaceryle alcyon*). During recent years an extensive study of the feeding habits of this species was made by White (1936-39) in the Margaree River, Nova Scotia. According to this author, the Kingfisher rates as an extremely dangerous predator to Atlantic Salmon and Speckled Trout.

e. Merganser or Saw-bill. Of three species found in North America only the largest, the American Merganser (*Mergus merganser americanus*), is widely distributed in inland waters. This species and the Red-breasted Merganser (*Mergus serrator*) are real fish-eaters. Around hatcheries and at the head of salmon or trout streams⁵ they may cause appreciable damage and are thus condemned. A very common attitude may be expressed by Leonard's remark about his experience with Mergansers in Michigan waters: "if there is one per mile of trout stream there is just one too many" (Leonard and Shetter, 1937, p. 337).

INTERRELATIONS BETWEEN BIRDS AND FISH

Multiple interrelations may exist between fish-eating birds and fish on which they prey (Hubbs and Eschmeyer, 1938, pp. 164-168). In the following lines some of these relations will be mentioned.

1. Parasite interrelations

Many parasites in different stages of development live both in fish and in their predators. The life histories of the flukes or trematodes are particularly complicated. Interesting information on the Eye Fluke (*Diplostomum flexicaudum*), which causes blindness in hatchery fishes, has been given recently by Ferguson and Hayford (1941). The "Black Spot" disease of Speckled Trout is also caused by the fluke *Apophallus brevis*, which in an adult state is found in the Loon (Miller, 1942).

The development of certain tapeworms or cestodes is relatively more simple, and thus a few examples will be sufficient to demonstrate the existing interrelations between fish-eating birds and their prey.

a. The Bass Tapeworm (*Proteocephalus ambloplitis*) in the adult stage causes both dwarfing and sterility in Small-mouth Bass.

This parasite has two consecutive intermediate hosts: first a minute crustacean (*Cyclops*) and second some small fish, such as Perch. Mergansers feeding on infected Perch reduce the number of intermediate hosts, thus protecting Bass from the dangerous tapeworm (Hubbs and Eschmeyer, 1938, p. 171).

b. The tapeworm (*Ligula intestinalis*) in larval stages is found in belly cavities of different fishes which serve as intermediate hosts. The adult worm, which is harmful only in that stage, lives in the intestines of the American and Red-breasted Mergansers (Lühe, 1910, pp. 18-19). In this case the predator feeding on infected fish suffers revenge, so to speak, from the parasite of its prey.

c. The intermediate host may be crustaceans instead of fish, but the full-grown tapeworm (*Fimbriaria fasciolaris*) lives in fish-eating birds. If fish feed on the small Copepod crustacean (*Diaptomus vulgaris*), infested with the larval stages of the tapeworm in question, then, in the process of digestion, the larvae are destroyed without harm to the fish. Consequently, the fish saves the predator (merganser), from these parasites (Lühe 1910, p. 123).

d. In the case of fish epidemic, there is always a chance that the fish-eating birds may spread a dangerous disease (*furunculosis*) from an affected area to other waters.

2. Food interrelations

In nature there are found very complicated "food chains" including numbers of different organisms. In these "chains" the fish-eating birds and their prey are only intermediate links, as birds themselves have their own predators⁶, etc. Munro and Clemens (1937) presented several food interrelations for fish and their feathered predators in British Columbia waters.

In general, the following three possibilities are the most common in food interrelations between fish-eating birds and their prey:

a. Birds may feed principally on game or pan fishes, for instance around hatcheries, or on spawning beds, or during migration of young and adult fishes.

b. Birds may feed principally on small fishes or other aquatic organisms, which at the same time constitute important food items for more desirable game or pan fishes.

5.—Accurate information on winter predation by the American Merganser in Michigan trout streams is given by Salyer and Lagler (1940).

6.—According to White (1939a), in the Margaree River the Bald Eagle (*Haliaeetus leucocephalus*) feeds on mergansers.

c. Birds may feed principally on fish or other animals which are in turn predators on game or pan fishes.

IMPARTIAL VIEWS ON HARM DONE BY FISH-EATING BIRDS

It seems that the desire, on the part of "bird lovers" and "extreme opponents", to generalize their respective findings on the extent of harm to the fisheries caused by feathered predators, is the main reason why partisans of both camps cannot agree. For instance, the article by Cottam and Uhler (1936), in which they stated that fish-eating birds do not cause extensive damage to game fishes, resulted in ardent disagreement on the part of fish culturists (see *Progressive Fish Culturist* for 1936). These experienced men, who had first-hand knowledge of vast destruction of fish by predators around hatcheries, are so used to the idea of damage to fish ponds, that they instinctively think that fish-eating birds do equally extensive harm everywhere.

Although birds may occasionally cause considerable damage to game fishes even in the open, they are not always to be blamed for the reduction of fish in lakes and rivers. Flocks of these flying enemies are particularly dangerous in "blitz attacks" over spawning areas and other places where fish congregate in large numbers.

However there are predators of another type found in the waters frequented by game fishes. They may be called by the modern term of "fifth columnists". They are "fin enemies" which are much more numerous than "winged assailants".

Exact knowledge of the "subversive activities" of each group is essential to understand the extent of harm caused by feathered predators alone.

1. Variation in diet of fish-eating birds

It is most important to remember that even birds belonging to the same species as, for instance, the American Merganser, often do not feed on the same kind of fishes in different localities. In other words, there is no particular preference for any one game or pan fish. Mergansers always eat the most abundant species present in a given area. These abundant species may be Speckled Trout, as in the many lakes of the Laurentides Park (Vladykov, MS), Atlantic Salmon, as in the Margaree River, N.S. (White, 1939a), Common Eels, as in the Gaspereau River,

N.S., during the winter months (Coldwell, 1939), or fresh-water Sculpins, as in British Columbia (Munro and Clemens, 1937), etc.

Within the same general region, there are often pronounced local differences in the type of birds' food, as has been shown by numerous authors. White (1937 and 1939a) found that in Kingfisher pellets, collected in the estuary of the Margaree River, young salmon constituted only about five per cent of the bulk, while in pellets of birds from the upper branches of the river salmon parr may amount to as high as eighty-seven per cent. The same variation in the food composition was shown by White (1939 and 1939a) for mergansers.

In British Columbia, Munro and Clemens analyzed the stomach contents of as many as 363 mergansers. The results of their important studies were published in several papers (1932-39). They noticed a definite change in the merganser's diet throughout the year, in accordance with seasonal variation of the most common food species. For instance, in the Cowichan River system, they found that Chum and Coho Salmon eggs, and to a lesser extent the flesh of spent salmon, constitute almost the entire food during November, December and the early part of January. On the other hand, during the summer months (August and September) Sculpins are eaten almost exclusively (Munro and Clemens, 1937, p. 25).

2. Role of predacious fishes

As was already mentioned, there are, in addition to birds, many other enemies of each game or pan species. Among these enemies, fin predators are probably the most destructive, as they not only live in the same medium as valuable game fishes, but are much more numerous there than birds.

The role of predacious fishes in Western Canada has been well studied, while in Eastern Canada, additional studies will be necessary to clarify this important problem. The two following examples may be cited in this connection.

a. *Margaree River, Nova Scotia.* During recent years, White (1936-39) made very interesting studies of predators in this river, which is famed for its excellent fishing for Atlantic Salmon. In one of his more recent papers (1939a), White named the most important predators of salmon, which, in addition to birds, include three species of

fishes: White Perch, Common Eel and Speckled Trout.

About the activities of these fin enemies, White (1939a) stated that "each perch contained two yearling salmon parr. The fact that White Perch are common in the South-west Margaree may be additional reason why parr on that branch are scarce". Eels are also common in this same branch, and "where eels are abundant there are few salmon parr".

"The trout is a great destroyer of young salmon.....The large trout, locally called the 'harbour trout', take many salmon parr and also smolts..... Individual trout containing five salmon have been taken".

It is rather unfortunate that White (1936-39) did not estimate the loss of young salmon caused by trout, eels and perch. In consequence, his practical conclusions about the damage by fish-eating birds are one-sided and far from being complete.

White (1939a, p. 4), for instance, estimated that "in 1935 Kingfishers took 350,000 salmon, 50,000 trout and 40,000 other fishes from the Northeast Margaree". If, on the other hand, we assume that each trout during a year ate 100 salmon parr, thus the removal of 50,000 trout by Kingfishers alone saved 500,000 salmon. In reality trout population in the Margaree River is many times greater than the number eaten by Kingfishers and, consequently, the destruction of young salmon by fish predators is probably several times greater than that caused by feathered enemies.

b. *Cultus Lake, British Columbia.* This interesting lake, important for its Sockeye Salmon, has been studied for a number of years by members of the Pacific Biological Station. Investigations by Munro and Clemens (1932-37) and Ricker (1941) showed clearly that in this area not fish-eating birds, but "fin enemies" are the most destructive for young Sockeye. These predacious fishes include the following species: Squawfish, Cutthroat Trout, Dolly Varden Char and Coho Salmon.

Foerster and Ricker (1941), in order to increase young Sockeye Salmon in Cultus Lake, took measures to reduce their fin enemies. According to these authors, the effect of reducing predacious fishes was more than encouraging. The average increase in survival rate since predator control has been started is from 3.13 to 9.95 per cent. In other words, where one Sockeye survived formerly, more

than three now live to go to sea. The conclusion of their important findings may be summarized by the following statement: "It can be claimed therefore as a further very important advantage of the destruction of predacious fish, that it will permit a much greater maximum population of Sockeye to inhabit the lake than has been the case heretofore (p. 332)".

3. *Problem of fish populations with stunted growth*

In general, the temperature of water and available food supplies are the major conditions that determine the rate of fish growth. An inadequate food supply in a given body of water may be responsible, in some cases, for the limited number of fish found there. More often, however, a scarcity of food causes stunting of local fish without reduction of their abundance.

In the case of various species of trout, very low temperatures during most of the year retard growth, giving rise to mature but stunted, emaciated fish of little sport value. Some extremely cold, glacier-fed streams and lakes at high elevations in states of the Rocky Mountain and Pacific coast regions have been shown to produce fish of this kind (Hazzard, 1933; Needham, 1940).

In certain lakes of the Laurentides Park, where spawning conditions are very favorable and fishing is limited, the present author (Vladykov, MS) observed that local Speckled Trout are extremely abundant but small in size. Overcrowded fish of these waters probably consume nearly all available food, thus resulting in an inadequate growth.

According to Hubbs and Eschmeyer (1938, pp. 156-157), "any species of fish may evidently be stunted for lack of adequate food, but certain species seem especially subject to stunting, presumably because of their special food requirements, spawning needs, or fecundity. In the Great Lakes region Perch and Rock Bass are probably more often and more notably stunted than are the other common food or game species".

In the case of dense populations of fish consisting of either stunted or dwarfed individuals⁷ a considerable reduction in fish stock is the only effective remedy. This may be ad-

7. —In some cases the fish remain of small size because of some hereditary factor, rather than because of an unfavourable environment (Hubbs and Eschmeyer, 1938, p. 157).

ministered, for instance, by limiting spawning facilities, or by increasing fishing, or by planting of fish-eating fishes, etc. Obviously the fish-eating birds in such bodies of water are very welcome as active helpers in proper fish management.

CONCLUSIONS

The facts presented throughout the present note indicate clearly that *predator problems* are very complicated and are in need of additional thorough studies before general agreement can be reached.

The definition of "desirable fish species" is not an easy one. The destruction of certain game fishes, such as Cutthroat or Speckled Trout, by predators may be helpful in saving more young Pacific or Atlantic Salmon.

There is a definite variation, local or seasonal, in the diet of fish-eating birds. Consequently the extent of damage done by winged predators should be considered separately in each case.

In addition to birds there is a long list of other enemies, among which the fin predators, being more numerous and living in the same habitats as more valuable game fishes, are probably the most dangerous. The activities of these "fifth columnists" are less conspicuous than those of birds and are often underestimated.

Due to several reasons, numerous species of animals in recent years have become extinct or are becoming extremely rare. Therefore, before pronouncing a verdict for wholesale extermination of any predator, very serious consideration of the problem should be undertaken.

In general, fish-eating birds are hardy, and therefore local control, practised in areas particularly suffering from these predators, will cause no danger of complete extermination of the species.

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APPENDIX I

LIST OF COMMON AND SCIENTIFIC
NAMES OF FISHES

To avoid the repetition of scientific terms, throughout the paper only the common names of fishes were given. Therefore in order to aid the reader to find the corresponding scientific names the following table is added.

| Common names | Scientific names |
|---|------------------------------|
| Atlantic Salmon | <i>Salmo salar</i> |
| Bass <i>see</i> Smallmouth or Largemouth Bass | |
| Brown Trout | <i>Salmo trutta</i> |
| Char <i>see</i> Dolly Varden Char | |
| Chum Salmon | <i>Oncorhynchus keta</i> |
| Coho Salmon | <i>Oncorhynchus kisutch</i> |
| Common Eel | <i>Anguilla bostoniensis</i> |
| Cutthroat Trout | <i>Salmo clarkii</i> |
| Dolly Varden Char | <i>Salvelinus malma</i> |
| Doré | <i>Stizostedion vitreum</i> |
| Eel <i>see</i> Common Eel | |
| Freshwater Sculpin | |
| (British Columbia) | <i>Cottus asper</i> |

| | |
|--|---|
| Grayling | <i>Thymallus thymallus</i> |
| Largemouth Bass | <i>Huro salmoides</i> |
| Maskinonge | <i>Esox masquinongy</i> |
| Pacific Salmon | Fishes belonging to the genus <i>Oncorhynchus</i> |
| Perch | <i>Perca flavescens</i> |
| Pink Salmon | <i>Oncorhynchus gorbus- cha</i> |
| Rock Bass | <i>Ambloplites rupestris</i> |
| Sculpin <i>see</i> Freshwater Sculpin | |
| Smallmouth Bass | <i>Micropterus dolomieu</i> |
| Sockeye Salmon | <i>Oncorhynchus nerka</i> |
| Speckled Trout | <i>Salvelinus fontinalis</i> |
| Spring Salmon | <i>Oncorhynchus tscha- wyscha</i> |
| Squawfish | <i>Ptychocheilus oregon- ensis</i> |
| Sunfishes | Different species belonging to the Sunfish family (<i>Centrarchidae</i>) |
| Trout <i>see</i> Brown, Cutthroat or Speckled Trout | |
| White Perch | <i>Morone americana</i> |
| Yellow Pickerel <i>see</i> Doré | |

NOTES AND OBSERVATIONS

OBSERVATION ON THE EARLY AUTUMN FAUNA OF SOUTHERN ALBERTA.— On October 4, 1942 I had occasion to visit some territory near Medicine Hat, Alberta, and while there took the opportunity of doing some collecting.

This district appears to be an extension of the prairie-grassland climax of the Montana region, though there was little of the tall prairie grasses.

I observed pronghorn antelope, coyotes, gophers, prairie weasels, prairie falcons, great horned owl, shrikes, horned larks, ring-neck pheasants, prairie chickens, Hungarian partridge and numerous ducks.

In the root cellar of an abandoned ranch five specimens of the black widow spider

(*Latrodectus mactans*) were taken. Several had the typical red hour-glass on the abdomen, while the others had rather indistinct red blotches.

Though there was quite a heavy frost during the night, I managed to catch alive several prairie rattlesnakes (*Crotalus c. confluentus*). A fair-sized bullsnake (*Pituophis sayi*) was also taken.

A number of ticks from the head of a weasel were later identified by J. D. Gregson of the Dominion Division of Entomology, Kamloops, B. C., as *Ixodes sculptus* Neumann and *Ixodes kingi* Bishopp — LIEUT. A. S. LOCKLEY, ARMY RESEARCH LABORATORIES, QUEEN'S UNIVERSITY, KINGSTON, ONTARIO

NOTES ON CHIPMUNKS OF THE GENUS *Eutamias*
IN CANADA¹

By R. M. ANDERSON and A. L. RAND

National Museum of Canada

Eutamias minimus

The material that has accumulated in the National Museum of Canada since Howell worked over our collection when preparing his monograph "Revision of the American Chipmunks" (1929, *North Amer. Fauna*, No. 52) gives a different picture of the eastern forms of *E. minimus* than that drawn by Howell.

The most important changes are that an undescribed form is represented in our material from northern Manitoba, and our material indicates that the name *neglectus* of Allen should be revived for the population Howell called *jacksoni*.

The forms recognizable in Canada are:

Eutamias minimus caniceps (Osgood)

Eutamias minimus borealis (Allen)

Eutamias minimus oreocetes (Merriam)

Eutamias minimus hudsonius new subspecies

Eutamias minimus neglectus (Allen)

The description of the new form, and the notes on two of the others follow,-

Eutamias minimus borealis (Allen)

NORTHERN INTERIOR CHIPMUNK

(*Tamias asiaticus*) var. *borealis* Allen, 1877, *Mon. North Amer. Rodentia*, pp. 793, 794—Fort Liard, Mackenzie.

This is a widespread form, ranging from southern Mackenzie and northeast British Columbia south to Banff and Eagle Butte, Alberta, and east to southeast Manitoba.

We have a series of 18 specimens from Wood Buffalo Park that we are assuming are typical *borealis*. A series of 20 from Jasper Park are similar, but with the under surface of the tail averaging slightly paler.

Crowe (1942, *Bull. Amer. Mus. Nat. Hist.* 88, p. 399) recorded *oreocetes* from Banff National Park, but our material from Banff (11 specimens) are closer to *borealis* in color though averaging small. This is evidently the southwest corner of this range. Howell (*op cit.* p. 54) records a National Museum specimen from Forget-me-not Mountain as *borealis* but it compares better in color and skull

characters with two Waterton Lake *oreocetes*, and should be referred to that form. A series of specimens from Eagle Butte, Alberta and Battle Creek, Saskatchewan, that might be expected to show a tendency toward the paler *pallidus* are on the contrary slightly darker on the upper parts than Jasper specimens, but the difference is too slight to use in separating them. Howell (*op. cit.* p. 55) has pointed out that a southern Saskatchewan (Indian Head) series shows an approach to *pallidus* that occurs farther south in the United States. A series of 14 specimens from Junction of Antler and Souris River, Turtle Mountain, Aweme, Dauphin, and Swan River (all in Manitoba) are slightly brighter, more intensely coloured than Wood Buffalo Park specimens, showing an approach to *neglectus*, but are closer to *borealis*. Three specimens from the vicinity of The Pas are greyer, an approach to the new form described below, but are also best referred to *borealis*.

Eutamias minimus hudsonius new subspecies

HUDSON BAY CHIPMUNK

Type. - No. 14786, National Museum of Canada; male adult; Bird, Hudson Bay Railway, Mile 349, northern Manitoba, Canada; 14 July, 1936; Ronald W. Smith; skin and skull in good condition.

Diagnosis. - Differs from *borealis* in having the under surface of the tail slightly paler; and in having less reddish brown on the shoulders, back, and rump, these parts having more dark grey in the fur. The hind legs too are more dark grey, less brownish; the dark dorsal stripes average wider, and the upper surface of the tail has the hairs buffy white and black rather than ochraceous or reddish brown and black. The general appearance is of a darker, greyer animal.

The skull is like that of *borealis*.

Measurements. - External measurements of 3 males from Bird and Thicket Portage are: total length 202, 211, 211 mm.; tail 94, 99, 101; hind foot 31, 31, 32; three females from Herchmer and Bird: t. l. 210, 214, 216; t. 97, 102, 103; h.f. 32, 33, 33. Six skulls of adults measure: greatest length 32.4 (32.1-33); zygomatic breadth 18.3 (18-18.6); cranial

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breadth 15.9 (15.6-16); least interorbital breadth 7.4 (7.1-8); length of nasals 9.7 (9-10.1).

Range: — Known only from northern Manitoba, intergrading with *borealis* in the vicinity of The Pas; probably occurs in extreme northwestern Ontario and northeastern Saskatchewan.

Remarks: — The series of seven specimens of this form taken in June, July and August exhibit only slight variation. The pelage of the head and that of the flanks is little different from that of *borealis* taken at a similar season, but on the back, rump and hind legs this form is a distinctly darker, greyer animal. Specimens from Readers Lake and Cormorant Lake are intermediate between this form and *borealis*.

Specimens examined: MANITOBA, Thicket Portage, (H. B. Ry. Mile 165,) 1; Herchmer, (H. B. Ry. Mile 412) 3; Bird (H.B. Ry. Mile 349) 3.

Eutamias minimus neglectus (Allen)

Lake Superior Chipmunk

Tamias quadrivittatus neglectus Allen, 1890, *Bull. Amer. Mus. Nat. Hist.*, 3, p.106 - east shore of Lake Superior, near mouth of Montreal River.

Eutamias minimus jacksoni Howell

1924, *Journ. Mamm.* 6: 1, 53. (Crescent Lake, Oneida Co., Wisconsin). Feb. 9, 1924.

Diagnosis. - Differs from *borealis* in being darker, more brownish generally. The crown and facial stripes are richer and browner, there is more and richer brown in the dorsal stripes; the rump and hind legs are darker and browner; the rusty of the sides is darker, and the tail is darker and redder, above and below, compared with *borealis*.

Measurements.- External measurements, Pancake Bay, 10 females, total length, 215.1 mm. (210-229); tail, 94.9 (88-105); hind foot, 32.7 (32-34); 5 males, t.l., 215.2 (212-223); t. 100.2 (94-105); h.f. 32.7 (32-33); Thunder Bay males, t.l., 228; t. 104; h.f., 31; females, t.l. 215, 215; t., 101, 103; h.f. 31, 31. Measurements of 7 skulls of adults from Pancake Bay: greatest length 32.1 (31.5-33); zygomatic breadth, 18.3 (17.6-19.1); cranial breadth 16.0 (15.7-16.2); least interorbital breadth 7.1 (6.7-7.6); length of nasals 9.7 (9-11).

Range. - From southeastern Manitoba across Ontario probably to Lake Abitibi, north at least to Lake Seul and Kapuskasing, and

southward into northern Michigan, Wisconsin and northeastern Minnesota; intergrading with *borealis* in southern Manitoba and probably with *hudsonius* in northern Ontario.

Remarks. - We are unable to follow Howell's treatment of Ontario least chipmunks. He referred specimens from the east shore of Lake Superior to *borealis*, thus putting *neglectus* in synonymy and leaving the darker form from the north and west of Lake Superior without a name and for which form he proposed the name *jacksoni*.

A survey of 27 specimens from Pancake Bay to the east of the type locality, 3 specimens from Schrieber to the west of the type locality as well as 2 Ridout and 3 Kapuskasing specimens indicates that all these animals are much darker and more richly colored than *borealis* from Wood Buffalo Park and Jasper National Park and that the name *neglectus* is available for them. That *jacksoni* is different is improbable, both from the original description and from the fact that Howell referred some western Ontario material (Lake Seul and Nipigon) to *jacksoni*.

We have seen no material from Abitibi. The specimen from Grand Rapids, Mattagami River is somewhat grey, and suggests intergradation with *hudsonius* that probably occurs in northern Ontario.

In 1938 Anderson examined a series of specimens from southeast Manitoba (Caddy Lake (2); Sandilands Forest Reserve (8); near Vivian (2) and near Telford (2)) in the J. Dewey Soper collection. The measurements were about the same as Lake Superior material: average 5 females, t.l. 213; t. 93.8; h.f. 31.8; and they agree in color with *neglectus*, to which they are referred

Material examined. - ONTARIO: Silver Inlet, Thunder Bay 5; Schreiber, 3; Lake Seul, 1; Ridout, 2; Coppermine Point, Algoma, 1; Haveland Bay, Algoma, 1; Pancake Bay, Algoma, 27; Kapuskasing, 5; Grand Rapids, Mattagami River, 1. Total 46 specimens.

Eutamias amoenus Allen

This little chipmunk, very similar to both *E. minimus* and *E. ruficaudus* occurs in Canada in central and southern British Columbia north to Hazelton and extreme western Alberta north to Jasper. Four subspecies are recognizable in Canada (see Howell, *op. cit.*): *affinus*, *felix*, *ludibundus* and *luteiventris*. Material accumulated by the National Museum somewhat extends the known range of the following form, -

Eutamias amoenus ludibundus Hollister

HOLLISTER CHIPMUNK

In British Columbia this form has been known north and west to Hazelton. H. M. Laing and C. J. Guiguet collecting for the National Museum in the Bella Coola area of British Columbia secured a large series from Kimsquit at the mouth of the Dean River, Stuie, Tweedsmuir Lodge, Caribou Mts. at 4700 feet altitude and the Mackenzie Valley and Mt. Brilliant in the Rainbow Mountains, extending the known range to the coast.

The Kimsquit specimens (9) are slightly more buffy beneath than the inland British Columbia specimens, and than the Jasper Park specimens, possibly showing a slight approach toward *felix*; the other specimens from inland are slightly paler on the underside of the tail than Jasper Park specimens, but the difference is trifling.

Eutamias ruficaudus Howell

This species, which is very close to *E. minimus* and *E. amoenus*, occurs only in southeast British Columbia and southwest Alberta. Two

subspecies occur.

Eutamias ruficaudus simulans Howell

COEUR D'ALENE CHIPMUNK

Ranging west of the Rocky Mountains, north to Nelson and Invermere.

Eutamias ruficaudus ruficaudus Howell

RUFIOUS-TAILED CHIPMUNK

Crowe (1943, *Bull. Amer. Mus. Nat. Hist.*, 80, p. 399) recorded *E. ruficaudus simulans* at Invermere in British Columbia, as far north as the species has been recorded. A specimen taken at the mouth of Portal Creek, Jasper Park, Alberta, altitude 3800 feet, Sept. 17, 1938, by R. M. Anderson is referable to *ruficaudus* and extends the known range of the species somewhat farther north, and of the subspecies *ruficaudus* north from Waterton Lakes National Park, where it occurs abundantly at higher levels in the extreme southwestern corner of Alberta as well as on the western side of the Alberta-British Columbia interprovincial boundary line in the same region.

BOOK REVIEW

THE BIG RIVER SURVEY, A COMPREHENSIVE STUDY OF NATURAL RESOURCES AS AN AID TO IMPROVED UTILIZATION. by D. S. Rawson, E. C. Hope, J. Mitchell, and E. W. Tisdale. Published by the University of Saskatchewan, 1943, 37 pages.

This is a co-operative project shared by the University of Saskatchewan, the Dominion Department of Agriculture and the Saskatchewan Department of Natural Resources. As its sub-title suggests it is a comprehensive survey in which a unit area is intensively studied by experts in various fields and reported upon in considerable detail. It is aimed at instigating conservation in its wide sense in a pioneer section of the province and the several topics discussed are summarized with an interesting discussion of the possibilities of the region, as typical of this section of the country. A thoroughly scientific study, the reports are deduced frankly, based on evidence as discovered and carefully analyzed.

The soil survey shows four main types of soils with podsollic types most extensive. Native vegetation is discussed under the headings of Forest, Meadow, and Aquatic, with a section on Forest Production showing

that little can be expected from commercial lumber exporting from the area in the future, although there is sufficient for domestic timber and farm needs. Interesting details are given regarding the history and possibilities of the region as a commercial fish producing area. The recreational and economic aspects of the wild life of the country are considered. A very interesting economic survey is made of eighteen of the farms already in existence here and various tables bring out the habits and living standards of the inhabitants. From this survey suggestions for possibilities of future settlement are formulated which are fairly typical of this whole section of Saskatchewan.

Such unit surveys cannot but aid in more intelligent utilization and settlement. It is to be hoped that this step is but a bottom rung of the ladder and that the suggestions and recommendations made in this and subsequent similar reports lead to definite action by those immediately concerned. The reading is aided by eleven photographs from the area and six well made maps. This publication is recommended to those interested in seeing action put into a conservation policy.—M.N. ZINCK.

THE SNOWSHOE RABBIT ENQUIRY, 1941-42¹

By HELEN CHITTY

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CANADA

During 1941-42 all observers in the Yukon reported an increase in the snowshoe rabbit population, a situation which had not occurred since the season 1934-35. Increase, which had been reported from the Northwest Territories beginning in 1938-39, still continued, and there were signs that rabbits were becoming plentiful, particularly near the Alberta border.

Throughout British Columbia reports were as in the previous year: in the north rabbits were plentiful and still increasing in numbers, while in the south they did not seem to have fluctuated at all.

In northern Alberta rabbits were very abundant and were believed by some observers to have been nearing their peak; in the central part of the province they were numerous and still increasing; in the south along the edge of the prairies and in the foothills of the Rockies they were beginning to come back. Reports from Saskatchewan showed continued increase. In some areas, particularly in the central part, rabbits were so numerous that "a person is hardly ever out of sight of rabbits". There was even an increase on the edge of the prairies where they had been very scarce. In Manitoba, outside the south and south-east, the increase had been very great, some observers said as much as 150%.

Throughout the prairie provinces there were many reports of hundreds of thousands being trapped with no apparent effect on the population. In fact, numbers had reached such high levels during 1940-42 that *increase* could not always be distinguished from *no change*, *abundant*. In order to make this situation more apparent on the map, reports of *no change*, *abundant* have been shown as circles with large black spots in them.

Passing from Manitoba to Ontario there was a sharp drop in the density of the rabbit population, which is impossible to see from the Map or Table 1 which do not distinguish different amounts of increase. Nevertheless, there was a general increase throughout the

north although rabbits were still reported as scarce except for a few points in the northwest. It is not clear what was happening in the south; most reports said *no change* and only in the eastern counties was there an appreciable amount of *increase*.

Increase still continued in Quebec with reports of abundance in some regions, chiefly in the District of Abitibi, along the Saguenay River and near the Straits of Belle Isle. South of the St. Lawrence, in the Eastern Townships and in the Gaspé, some observers reported a decrease.

It is impossible to obtain a clear picture of the situation in New Brunswick. The rabbit population seemed to be very patchy with reports from some localities of the greatest density seen for some years, and from others of there never having been fewer rabbits. In Nova Scotia, however, the picture is much more definite. The decrease reported in 1940-41 only from Cape Breton Island had become established on the mainland to the extent that 55% instead of 27% observers in the whole province reported fewer rabbits.

For a second year reports were received of disease and mortality among the snowshoe rabbit population. (There were also a great many references to tapeworm infestations which are not mapped as epidemic.) Most of these observations came from within 150 miles radius of Lesser Slave Lake, Alberta, lying between the two main epidemic areas of 1940-41, where neither decrease nor continued epidemics were appreciable in 1941-42. Reports from this area are given below:

"Blisters toward spring. Some dying in great pain not caused by blisters or boils. In March, breeding season, often heard squealing in bush, on investigation found dying in great pain. Dead in a minute. No sudden decrease" (F. L. Cavett).

"During whole winter. Rabbits were seen to fall over and kick and were dead. Some with lumps on sides." (J. V. Logan).

"Rabbits appeared to be dying off last summer. Dozens were seen on the trails in a semi-conscious condition. In spite of sickness rabbits were as plentiful during the win-

¹ —Received for publication July 31, 1943.

TABLE I

Reports for 1941-42 about changes in abundance of snowshoe rabbits in Canada compared with 1940-41 (each year ending 31 May).

| | No. of Observers | | | | | % of Observers | | | |
|-----------------------------|------------------|----------|-----------|-------|----------|----------------|----------|-----------|----------|
| | Increase | Decrease | No Change | Total | Epidemic | Increase | Decrease | No Change | Epidemic |
| Yukon | 11 | — | — | 11 | 0 | 100 | 0 | 0 | 0 |
| Northwest Territories | 19 | 2 | 6 | 27 | 0 | 70 | 7.5 | 22.5 | 0 |
| British Columbia | 31 | 8 | 25 | 64 | 1 | 48.5 | 12.5 | 39 | 1.5 |
| Alberta | 61 | 4 | 29 | 94 | 8 | 65 | 4 | 31 | 8.5 |
| Saskatchewan | 51 | 7 | 18 | 76 | 1 | 67 | 9 | 24 | 1 |
| Manitoba | 42 | 5 | 18 | 65 | 0 | 65 | 7.5 | 27.5 | 0 |
| Ontario | 48 | 4 | 25 | 77 | 0 | 62.5 | 5 | 32.5 | 0 |
| Quebec and Labrador | 31 | 5 | 9 | 45 | 1 | 69 | 11 | 20 | 2 |
| New Brunswick | 7 | 3 | 6 | 16 | 1 | 44 | 18.5 | 37.5 | 6 |
| Nova Scotia | 5 | 24 | 15 | 44 | 0 | 11 | 55 | 34 | 0 |
| Total | 306 | 62 | 151 | 519 | 12 | 59 | 12 | 29 | 2 |

TABLE II

Report for 1941-42 about changes in abundance of snowshoe rabbits in U. S. A. (L. americanus only) compared with 1940-41 (each year ending 31 May).

| State | No. of Observers | | | |
|---------------------|------------------|----------|-----------|-------|
| | Increase | Decrease | No Change | Total |
| Maine | 1 | 2 | 1 | 4 |
| Michigan | 13 | — | 5 | 18 |
| Minnesota | 9 | 1 | — | 10 |
| New Hampshire | 1 | — | — | 1 |
| New York | 2 | — | 1 | 3 |
| Pennsylvania | 2 | — | — | 2 |
| Vermont | 2 | — | — | 2 |
| West Virginia | — | — | 1 | 1 |
| Wisconsin | 6 | 1 | 2 | 9 |
| Total | 36 | 4 | 10 | 50 |
| Percentage | 72 | 8 | 20 | |

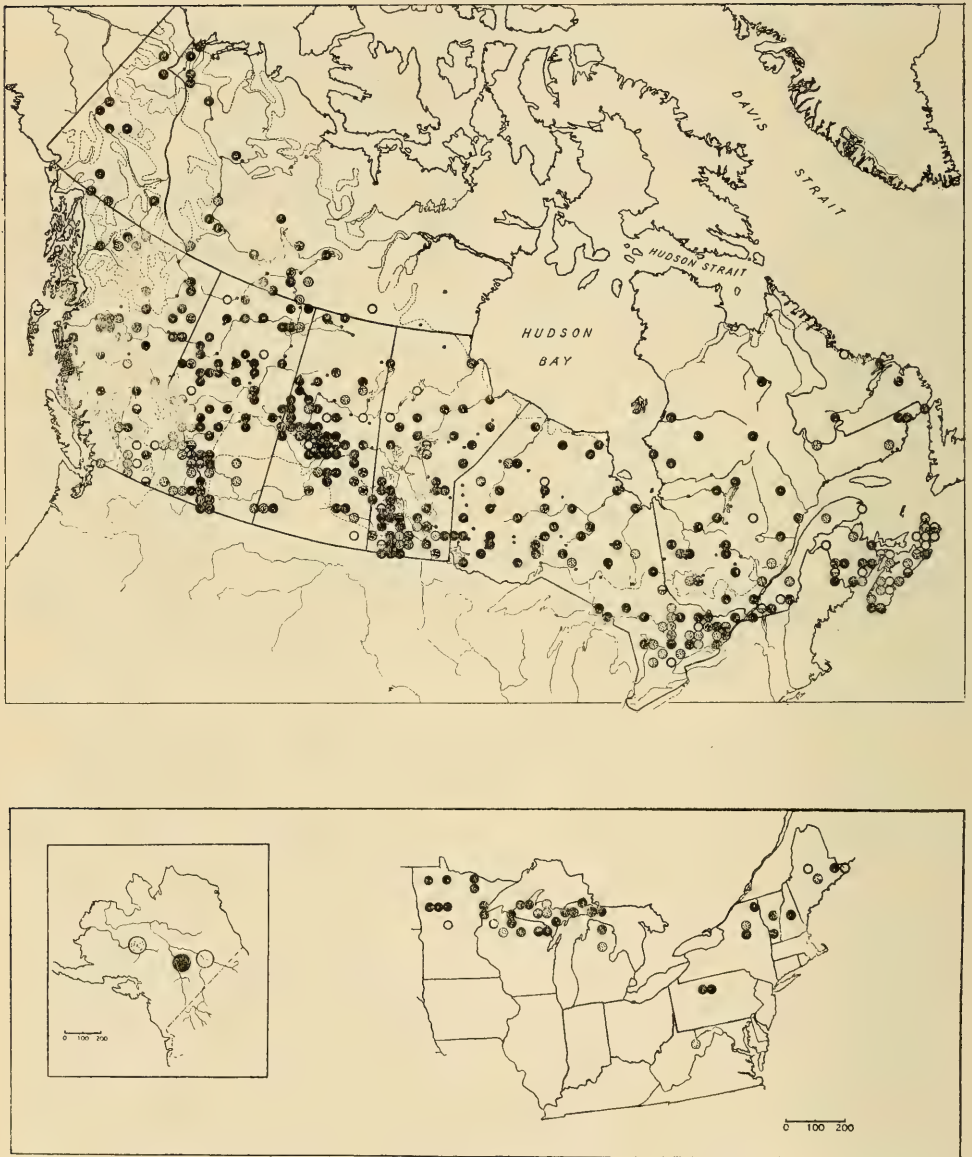


Fig. 1. Reports for 1941-42 about changes in abundance of snowshoe rabbits compared with 1940-41. Each circle of 30 miles diameter (100 miles in Alaska) marks the approximate centre of a stretch of country reported on by one or more observers. (*Canadian Field-Naturalist* 54: 117). INCREASE reports are shown black; DECREASE white; NO CHANGE, ABUNDANT large irregular dots: all other NO CHANGE stippled. Where reports at the same centre disagree the circle is divided up in proportion to the number of opinions of each kind.



Fig. 2. Reports of disease and epidemics in showshoe rabbits during 1941-42. Each circle of 30 miles diameter marks the approximate centre of an area in which mortality was reported by one observer.

ter as they have been for the past 10 years." (H. Gallagher).

"March and April, seen many dead but are very plentiful in this locality yet." (D. B. Harrington).

"The rabbits are dying off now. You can see three to one dozen dead ones in one mile's walk any place in this district." (H.J. Haight).

"From last October saw some dead rabbits in places during winter and recently some that had just died. Natives report disease in some." (E. Hogue).

"Noticed some rabbits dying in March but not in any great numbers." (L. Silver).

Other isolated reports are as follows:

British Columbia, Peace River Block,

"All months, numbers of rabbits were found dead from time to time in small areas, say like 10 acres; some apparently died of disease and some of worms." (W. O. Quesnel).

Alberta, North Vermilion,

"Quite a number were found dead and many of those killed were diseased (water blisters and spotted livers)." (R. Hancock).

Saskatchewan, Green Lake district,

"In month of February noticed in several cases rabbits appeared weak and quite easily caught by hand, but only in small quantity."

Quebec, Bersimis area,

"Rabbits were reported plentiful in most places last winter with no disease noticed. However, this spring, during April and May the Indians report observing signs of disease among the rabbits and of finding them dead." (G. Dowlie).

New Brunswick, North Lake, York County,

"Last August saw rabbits that were dying. They had a tick, light brown in colour, looked like a wood tick. The rabbits I saw were very dumb. I picked up three, they did not have life enough to move." (C. Lewin).

UNITED STATES AND ALASKA

The increase reported last year from Minnesota was confirmed by most observers for 1941-42, but Dr. R. G. Green said that the population in the Lake Alexander area had fallen from 160 per square mile in 1941 to 71 in 1942. Throughout Wisconsin increase was generally evident as indicated by Mr. W. E. Scott's report that 173,683 rabbits had been killed by hunters that season, almost double the previous year's bag of 93,012. Of the 41 warden's reports 26 noted increase, 13 no change and 2 decrease. In Michigan recov-

ery had continued and increase was more marked, especially in the northern peninsula. In the Eastern States the increase was general but not very great.

Reports from Alaska of very slight increase in the rabbit population indicated that the bottom of the cycle had been passed and recovery was beginning. Mr. O. M. Geist of the University of Alaska made these comments, "There are just enough batches of new rabbit litters to make the differences between *very* few, and few. But, there *is* a difference: first district for rabbits to increase so one can not help but notice it is the Circle country. They seem to have had the increase of young this spring and summer, which I expect near Fairbanks next spring and summer, although a slight increase is noticeable near Fairbanks already in 1942." On the map the Circle area is shown as *decrease* because an observer centred on that point reported fewer rabbits than in the previous year, although this is at variance with reports of two observers centred on Fairbanks. The errors of the conventional system of mapping are more obvious in Alaska because of the small number of observers and the great areas (often widely separated) which are covered by their reports.

ACKNOWLEDGEMENTS

Reports have been sent in this year by 555 observers in Canada - 145 men of the Royal Canadian Mounted Police, 144 provincial game wardens, 69 National Park wardens, 154 Hudson's Bay Company post managers and 43 others. From the United States 51 reports were received and from Alaska seven, four of which, covering separate areas, were again supplied by Mr. Frank Dufresne. We are grateful to these 610 men for their continued co-operation.

We are also again indebted to Mr. Hoyes Lloyd of the National Parks Bureau, Ottawa, Mr. R. G. H. Bonnycastle of the Hudson's Bay Company, Winnipeg, and Dr. H. H. T. Jackson of the U.S. Fish and Wildlife Service, Washington, D.C., through whom the data have been received.

Grants for the work in Oxford have been made by the Carnegie Corporation of New York through the Carnegie Institution of Washington and by the Hudson's Bay Company.

SUMMARY

Six hundred and ten observers in Canada, the United States and Alaska reported on the

density of the snowshoe rabbit, *Lepus americanus*, in 1941-42 compared with the previous year. The long term cycle in numbers was at different stages; in Alaska rabbits were just beginning to come back, in the prairie provinces they were approaching their peak of abundance, and in Nova Scotia they were passing it. In other parts of Canada and in the United States from Minnesota

east, numbers were mostly increasing through various levels of abundance.

REFERENCES

This report is the eleventh in a series covering each of the years from 1931-32. The last two reports were published in the *Canadian Field-Naturalist*, 56: 17-21, 1942 and 57: 64-68, 1943, all previous references being contained in the earlier of these two papers.

DR. T. GILBERT PEARSON

IT IS WITH GREAT REGRET that Canadian naturalists have learned of the death of Dr. T. Gilbert Pearson, which occurred after a short illness in New York City on September 3, 1943.

His career in wild-life protection has been a long and honourable one. From 1905 to 1910 he was Secretary of the National Association of Audubon Societies, and Executive Secretary, 1910-1920, becoming President in 1920 and continuing in that office until October, 1934 when he was named President Emeritus. The great expansion of the conservation activities of the Society occurred during his active term of service and it is well known that finding the Society in straightened circumstances he left it with ample funds.

In 1922 he founded the International Committee for Bird Preservation, became its first President and continued in its councils until 1938 when he relinquished office. From 1938 until his demise he was active in organizing and developing the Pan-American Section of the International Committee, his latest extended journey having been to visit most of the Latin American countries in connection with this work.

Perhaps J. Hammond Brown, President of the Outdoor Writers Association of America, hits one of the secrets of his great success in the conservation world when he says that Dr. Pearson was a connecting link between the sportsman and the bird lover. He understood both of them perfectly, could talk the language of each, and was honoured and respected by both groups. In concluding his remarks Mr. Brown says:

"If ever a man deserved loving remembrance at the hands of his fellow workers it was this stout-hearted fighter who would never admit defeat and if a mountain was too high to climb, painfully trudged his way around its base to attain his goal on the other side.

Those of us who loved him for himself and for the great things he accomplished can best keep his memory green by carrying on the fight to protect that outdoors with all its wild creatures, that outdoors which he so greatly loved and fought so valiantly to preserve."

—HOYES LLOYD, NATIONAL PARKS BUREAU
OTTAWA.

BIRD OBSERVATIONS TAKEN AT ALBANY, NOVA SCOTIA¹

By R. W. TUFTS

Wolfville, N. S.

DURING THE PERIOD 1924-42, nineteen consecutive years, considerable time has been spent at Trout Lake, Albany, Annapolis Co., Nova Scotia, where I have a cabin located on a small island near the head of the lake.

On the occasion of these visits which have covered each month of the year I have recorded on a chart the various species of birds seen with notations which indicate those which were actually found breeding. All observations were made within a radius of approximately two miles of the camp.

The general topography of the region under review might be briefly described as follows:—Elevation, about 650 feet above sea-level, nearest coastal point from Trout Lake being the Bay of Fundy, which is about fifteen miles by air-line. The rock formation is mostly granite and this particular area is, for the most part, unsuited for agriculture. The settlement of Albany is situated about twelve miles from Middleton on the main trans-provincial highway which runs southerly from that town to Bridgewater (a distance of about 60 miles) and is made up of a series of small farms.

About 85 years ago a forest-fire (still referred to by the older residents as "The Great Fire") ranged over a large area in this section of the Province, destroying great quantities of valuable stands of virgin white pine and spruce. Thousands of tall dead pine trees are still standing, silhouetted against the sky-line, where they tower above the new growth of mixed hard and soft wood. Many more thousands of these giant pines lie prostrate on the ground in various stages of decay, and in a relatively few years, all of them will be down.

The present growth consists of spruce, fir, hemlock, pine, tamarack, maples, birch, beech, oak, alder and some others. The surface is undulating and is drained by several sluggish streams which meander through sphagnum swamps till they reach their outlet into Trout

Lake. This lake is about two miles in length, with an average width of a quarter of a mile.

It might be said that this small section herein described is more or less typical of the interior of southern Nova Scotia, hence the bird life too, which is listed below, is for the most part, typical of the larger area.

The figures in parenthesis which follow the names of the species indicate the number of years each was observed and are inserted as an indication of its relative abundance in this restricted area; the symbol (b) indicates that the species breeds, (p.b.) that it probably breeds.

COMMON LOON *Gavia immer immer* (19) (b)

RED-THROATED LOON *Gavia stellata* (1)

This small loon was seen on June 2, 3, and 9, 1940, swimming on the lake. It was examined through 8-powered binoculars at relatively close range. The bird was in winter plumage.

LEACH'S PETREL *Oceanodroma leucorhoa leucorhoa* (1)

A single bird was seen Aug. 7, 1936, sitting on the surface of the lake. It allowed the canoe to come within a few feet, when it would flutter over the surface a few yards and again alight. Its behavior suggested that the bird was in a state of semi-exhaustion.

DOUBLE-CRESTED CORMORANT *Phalacrocorax auritus auritus* (1)

A lone bird seen perched on a granite boulder in the lake, on August 7, 1941.

GREAT BLUE HERON *Ardea herodias herodias* (16)

AMERICAN BITTERN *Botaurus lentiginosus* (5) (pb)

CANADA GOOSE *Branta canadensis canadensis* (1)

A flock of twenty or so seen flying high overhead in south-westerly direction on October 29, 1939.

1. —Received for publication October 28, 1943.

BLACK DUCK *Anas rubripes* (17) (b)

OLD SQUAW *Clangula hyemalis* (1)

Two males seen at relatively close range on November 16, 1930 swimming in the lake.

SURF SCOTER *Melanitta perspicillata* (1)

A female of this species was seen on the lake on June 3, 1936. In order to establish its identity the bird was collected.

AMERICAN SCOTER *Oidemia americana* (1)

Two were seen on May 22, 1938, swimming in the lake.

AMERICAN COMMON MERGANSER *Mergus merganser americanus* (1)

One collected October 22, 1933.

RED-BREADED MERGANSER *Mergus serrator* (17) (b)

This species occurs with marked regularity each spring at Trout Lake. During the early part of May the female is accompanied by the male thus solving the problem of identification. About the middle of May the males disappear and on a number of occasions the female (presumably of this species) has been seen followed by downy young.

EASTERN GOSHAWK *Astur atricapillus atricapillus* (15) (b)

SHARP-SHINNED HAWK *Accipiter velox velox* (14) (b)

EASTERN RED-TAILED HAWK *Buteo borealis borealis* (10) (b)

MARSH HAWK *Circus hudsonius* (9) (b)

OSPREY *Pandion haliaetus carolinensis* (13) (b)

EASTERN PIGEON HAWK *Falco columbarius columbarius* (1)

One was seen on September 17, 1939, flying across the lake.

EASTERN SPARROW HAWK *Falco sparverius sparverius* (13) (b)

SPRUCE GROUSE *Canachites canadensis canace* (12) (b)

This particular type of terrain appears to be ideal habitat for this bird. During the period covered by this report approximately 30 nests of the species were examined and in each case the bird had ceased laying. The smallest set contained four and the largest seven eggs.

NOVA SCOTIA RUFFED GROUSE *Bonasa umbellus thayeri* (15) (b)

COMMON PHEASANT *Phasianus colchicus* (1)

Two half grown young were seen in July, 1936, crossing the highway near a farm where I happen to know a brood was raised under a hen. Pheasants have not thrived in the area covered by this report, though they appear to be increasing in the more thickly settled agricultural district of the Annapolis Valley a few miles away where a small number were liberated a few years ago.

SEMIPALMATED PLOVER *Charadrius semipalmatus* (1)

A small flock seen flying overhead, August 25, 1939. They were identified by their familiar call note.

AMERICAN WOODCOCK *Philohela minor* (7) (b)

WILSON'S SNIPES *Capella delicata* (8) (b)

SPOTTED SANDPIPER *Actitis macularia* (19) (b)

EASTERN SOLITARY SANDPIPER *Tringa solitaria solitaria* (2)

Seen along the lake shore in August.

GREATER YELLOW-LEGS *Totanus melanoleucus* (7)

A number of individuals have been seen both spring and fall during the migration periods.

LEAST SANDPIPER *Pisobia minutilla* (2)

These were seen flying over in the early autumn, and were identified by their call notes.

GREAT BLACK-BACKED GULL *Larus marinus* (18)

This bird formerly used, as a nesting site, a certain large boulder which rises some six or eight feet above the lake surface, and which is still known to some of the older residents as "Gull Rock". The popularity of this lake as a summer resort in more recent years probably accounts for the gulls having abandoned the old nesting site.

HERRING GULL *Larus argentatus smithsonianus* (6)

TERN *Sterna* ? (1)

A single individual seen resting on the surface of the lake in September 1927, but I was not able to determine whether it was a Common or Arctic Tern.

DOVEKIE *Alle alle* (1)

One seen on the surface of the lake on November 19, 1941. It permitted the canoe to come within a few feet before taking flight when it would fly only a few yards before again alighting.

GREAT HORNED OWL *Bubo virginianus virginianus* (10) (b)BARRED OWL *Strix varia varia* (17) (b)

A pair of Barred Owls has used the same nesting-stump for ten non-consecutive years, during the period covered by this report.

EASTERN SAW-WHET OWL *Cryptoglaux acadica acadica* (8) (b)

Though this little owl is reported eight times, it was seen but once, at which time the female was removed by hand from the nest in an old pine where she was brooding newly hatched young. The other records were made from birds heard calling at night. These notes invariably came from the same direction and locality, across the lake, in early spring, suggesting a nest.

EASTERN WHIP-POOR-WILL *Antrostomus vociferus vociferus* (1)

A bird heard calling at night, across the lake, in May, 1939, constitutes the only record for the locality.

EASTERN NIGHTHAWK *Chordeiles minor minor* (18) (b)CHIMNEY SWIFT *Chaetura pelagica* (17) (b)

Some years ago one of these birds was seen to drop below the surface of the earth on the premises of an abandoned farm. Proceeding to the spot, an old well, lined with rocks was discovered, and the bird was seen sitting on a nest which was fastened to the perpendicular side of one of these rocks, about four or five feet below the surface of the ground and some two or three feet above the surface of the water.

RUBY-THROATED HUMMINGBIRD *Archilochus colubris* (10) (pb)EASTERN BELTED KINGFISHER *Megaceryle alcyon alcyon* (18) (b)YELLOW-SHAFTED FLICKER *Colaptes auratus luteus* (19) (b)NORTHERN PILEATED WOODPECKER *Ceophloeus pileatus abieticola* (8) (b)EASTERN YELLOW-BELLIED SAPSUCKER *Sphyrapicus varius varius* (17) (b)NORTHERN HAIRY WOODPECKER *Dryobates villosus septentrionalis* (16) (b)NORTHERN DOWNY WOODPECKER *Dryobates pubescens medianus* (14) (b)EASTERN KINGBIRD *Tyrannus tyrannus* (4) (pb)YELLOW-BELLIED FLYCATCHER *Empidonax flaviventris* (11) (b)ALDER FLYCATCHER *Empidonax traillii traillii* (6) (b)LEAST FLYCATCHER *Empidonax minimus* (9) (pb)EASTERN WOOD PEWEE *Myiochanes virens* (5) (b)OLIVE-SIDED FLYCATCHER *Nuttallornis mesoleucus* (18) (b)TREE SWALLOW *Iridoprocne bicolor* (18) (b)BANK SWALLOW *Riparia riparia riparia* (4) (pb)BARN SWALLOW *Hirundo erythrogaster* (19) (b)NORTHERN CLIFF SWALLOW *Petrochelidon albifrons albifrons* (19) (b)CANADA JAY *Perisoreus canadensis canadensis* (13) (b)

A number of nests of this species have been examined in this area, several of which contained fresh eggs during the first week in April.

NORTHERN BLUE JAY *Cyanocitta cristata cristata* (17) (b)NORTHERN RAVEN *Corvus corax principalis* (19) (b)EASTERN CROW *Corvus brachyrhynchos brachyrhynchos* (18) (b)BLACK-CAPPED CHICKADEE *Penthestes atricapillus atricapillus* (18) (b)ACADIAN CHICKADEE *Penthestes hudsonicus littoralis* (14) (b)EASTERN WHITE-BREASTED NUTHATCH *Sitta carolinensis carolinensis* (3) (pb)RED-BREASTED NUTHATCH *Sitta canadensis* (12) (b)EASTERN BROWN CREEPER *Certhia familiaris americana* (13) (b)EASTERN WINTER WREN *Nannus hiemalis hiemalis* (10) (b)

- CATBIRD *Dumetella carolinensis* (7) (b)
 EASTERN ROBIN *Turdus migratorius migratorius* (19) (b)
 EASTERN HERMIT THRUSH *Hylocichla guttata fazoni* (19) (b)
 EASTERN OLIVE-BACKED THRUSH *Hylocichla ustulata swainsoni* (16) (b)

VEERY *Hylocichla fuscescens fuscescens* (3)

The three records of the Veery were based on songs heard during May. The fact that the songs were not heard regularly suggests that these birds were migrating.

EASTERN GOLDEN-CROWNED KINGLET *Corthylio calendula calendula* (16) (b)

EASTERN RUBY-CROWNED KINGLET *Regulus satrapa satrapa* (16) (b)

CEDAR WAXWING *Bombycilla cedrorum* (14) (b)

These birds are rare or absent in this region until late in June or the early part of July. During the balance of the summer season they are more or less abundant apparently attracted by the blueberries and other wild fruits which grow in profusion.

SHRIKE *Lanius* sp. (1)

Both the Northern and Migrant Shrikes occur in Nova Scotia. One seen on March 23, 1930 might well have been a late departing Northern or a newly arrived Migrant.

BLUE-HEADED VIREO *Vireo solitarius solitarius* (19) (b)

RED-EYED VIREO *Vireo olivaceus* (12) (b)

BLACK AND WHITE WARBLER *Mniotilta varia* (17) (b)

TENNESSEE WARBLER *Vermivora peregrina* (7) (b)

NASHVILLE WARBLER *Vermivora ruficapilla ruficapilla* (12) (b)

NORTHERN PARULA WARBLER *Compsothlypis americana pusilla* (18) (b)

EASTERN YELLOW WARBLER *Dendroica aestiva aestiva* (9) (b)

MAGNOLIA WARBLER *Dendroica magnolia* (18) (b)

CAPE MAY WARBLER *Dendroica tigrina* (1)
 A rare spring migrant for this section. The specimen was collected.

NORTHERN BLACK-THROATED BLUE WARBLER
Dendroica caerulescens caerulescens (17) (b)

MYRTLE WARBLER *Dendroica coronata* (19) (b)

BLACK-THROATED GREEN WARBLER *Dendroica virens virens* (18) (b)

BLACKBURNIAN WARBLER *Dendroica fusca* (13) (b)

This bird was formerly looked upon as a transient, but in late June, 1937, a female was seen feeding well fledged young.

CHESTNUT-SIDED WARBLER *Dendroica pensylvanica* (12) (b)

BAY-BREASTED WARBLER *Dendroica castanea* (5) (b)

A female of this species was seen in June, 1937, carrying food to her young.

BLACK-POLL WARBLER *Dendroica striata* (8)

The eight records mentioned in this report were all taken during late May or early June.

YELLOW PALM WARBLER *Dendroica palmarum hypochrysea* (19) (b)

OVEN-BIRD *Seiurus aurocapillus* (12) (b)

NORTHERN WATER-THRUSH *Seiurus noveboracensis noveboracensis* (16) (b)

NORTHERN YELLOW-THROAT *Geothlypis trichas brachidactyla* (18) (b)

WILSON'S WARBLER *Wilsonia pusilla pusilla* (1)

CANADA WARBLER *Wilsonia canadensis* (10) (b)

AMERICAN REDSTART *Setophaga ruticilla* (13) (b)

ENGLISH SPARROW *Passer domesticus domesticus* (10) (b)

RUSTY BLACKBIRD *Euphagus carolinus* (16) (b)

BRONZED GRACKLE *Quiscalus quiscula aeneus* (7) (b)

ROSE-BREASTED GROSBEEK *Hedymeles ludovicianus* (9) (b)

EASTERN PURPLE FINCH *Carpodacus purpureus purpureus* (19) (b)

CANADIAN PINE GROSBEEK *Pinicola enucleator leucura* (7) (pb)

COMMON REDPOLL *Acanthis linaria* (2)

NORTHERN PINE SISKIN *Spinus pinus pinus* (6) (pb)

EASTERN GOLDFINCH *Spinus tristis tristis*
(4) (b)

RED CROSSBILL *Loxia curvirostra pusilla* (2)
No specimens were collected and it is possible that some or all of these were Newfoundland Crossbills (*Loxia curvirostra perna*).

WHITE-WINGED CROSSBILL *Loxia leucoptera*
(6) (b)

A nest of this species was found in September, 1931. It was located within ten yards of my camp door in a spruce tree. Two of the young left the nest on September 8th. A third bird was found dead in the nest after the others had gone.

EASTERN SAVANNAH SPARROW *Passerculus sandwichensis savanna* (8) (b)

EASTERN VESPER SPARROW *Poocetes gramineus gramineus* (3) (b)

SLATE-COLORED JUNCO *Junco hyemalis hyemalis* (19) (b)

EASTERN CHIPPING SPARROW *Spizella passerina passerina* (4) (b)

WHITE-THROATED SPARROW *Zonotrichia albicollis* (19) (b)

EASTERN FOX SPARROW *Passerella iliaca iliaca* (4)

The four observations above cited were all taken during the fall migration.

SWAMP SPARROW *Melospiza georgiana*
(18) (b)

EASTERN SONG SPARROW *Melospiza melodia melodia* (19) (b)

NOTES AND OBSERVATIONS

DIPTEROUS LARVAE PARASITIC ON NESTLINGS OF THE SONG SPARROW. — On June 26, 1942, at Kirk's Ferry, Quebec, I found a nest of the song sparrow, containing five young birds, in the long grass near the roadside. On June 27 the birds had left the nest and when I picked it up to examine it, seven Dipterous larvae were found crawling in the fabric of the nest and on the ground beneath it. The nest was placed in a battery jar containing an inch of earth and the jar was covered with cheesecloth. On July 13 one adult fly

emerged, and the next day six adults emerged. The adults were pinned and were examined by Mr. A. Brooks of the Division of Systematic Entomology, Department of Agriculture. He determined them to be five males and one female of the fly *Protocalliphora splendida splendida* Macq. (family-Calliphoridae), a blood-sucking parasite of nestling birds. The specimens were deposited in the National Collection among specimens of the same and other species of the genus collected from nestlings. — W. W. JUDD, 297 Glen Road, Toronto.

CURRENT LITERATURE

GENUS ASTER IN NOVA SCOTIA. By L. H. Shinnars. *Rhodora* 45: 344-351. 1943.

Although professing not to be an exhaustive work on the genus in the Province it nevertheless is a valuable collection and critical analysis of known data. Beginning with a well arranged key, Mr. Shinnars goes on to describe 17 species (1 a hybrid) grouped into 9 series. The synonymy of a few more difficult species is discussed brief-

ly. No attempt is made to explain all varieties. One new species *Aster Rolandii* named in honor of Provincial Botanist, Albert E. Roland, is described from gravelly and wet places along the coast, ranging from Quebec to Sable Island. *A. lateriflorus* (L.) Britton var. *tenuipes* Weigand is accorded specific rank as *A. tenuipes*. Reference to this paper should be made by anyone interested in making a study of members of the genus in this region.—M. N. ZINCK.

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Div. of Botany, Central Experimental Farm,

OTTAWA, CANADA

THE BRACHYURAN CRABS OF BOUNDARY BAY, BRITISH COLUMBIA ¹

By DONALD C. G. MACKAY

International Pacific Salmon Fisheries Commission, New Westminster, B.C.

THE PRESENT OBSERVATIONS are a by-product, so to speak, of a study of the Pacific Edible Crab, *Cancer magister* Dana, carried out by the writer for the Fisheries Research Board of Canada (formerly the Biological Board of Canada) during the years 1930-34 and 1941. During numerous and extensive collecting trips in connection with the study of the Edible Crab, the writer noted, collected, and identified crabs of other species as well. In addition to shore collecting trips at low tide, collections were made while accompanying commercial crab fishermen on their rounds and likewise through the use of a number of special traps covered with fine netting in order to capture crustaceans of all sizes and species. The dredging activities of the A. P. Knight of the Fisheries Research Board during August, 1933 also aided in this work.

Boundary Bay is located on the International border between Canada and the United States, most of the bay being in Canada (See Fig. 1). Nearly all parts of the bay on both sides of the border were visited but all collecting was done on the Canadian side. The bay is relatively shallow, warm, and protected. Shore and bottom conditions range from muddy in the northeastern portion to rocky in the southeastern part. Considerable areas of the bottom of the bay are provided with shallow dykes and are used commercially for the propagation of oysters.

It will be noted that the number of species is considerably smaller than that reported for the Gulf of Georgia (25 species) and for Victoria and Friday Harbour, Washington (22 species); it is somewhat smaller than that for Clayoquot Sound (17 species), Esperanza Inlet (15 species), the Queen Charlotte Islands (15 species), and Queen Charlotte Sound and north (15 species) (Hart, 1940). For the entire Pacific Coast of Canada 28 species have been recorded (Hart, 1940).

All species of true crabs (Brachyura) found by the writer were included with the single exception of the commensal crabs often found living within the mantle cavities of pelecypod molluscs. The smallness of the number of species can hardly be ascribed entirely to the methods of collecting although it is likely that some unabundant species were not discovered. It seems more probable that the relatively high temperature of this shallow bay, the character of its bottom, and the relative abundance there of the edible species are important ecological factors contributing to the situation as a whole.

All of the species reported herein are listed by Clemens (1933) and have been reported previously from the Province of British Columbia. The presence of these species in Boundary Bay, the southernmost bay on the mainland coast of Western Canada, is of interest and through such records as these the factors controlling the distribution of species and other problems of ecology and zoogeography become better understood.

All measurements were made with a Glogau sliding jaw caliper. For the sake of brevity these are designated according to the following system:

- (1) Length of crab in millimeters as measured along the median line of the carapace from the anterior to the posterior margin exclusive of curvature.
- (2) Length of the rostrum as measured from the tip to the posterior line of the upper margins of the orbits.
- (3) Greatest carapace width exclusive of curvature.
- (4) Length of the right cheliped or claw appendage from the articulation of the coxa with the sternum to the tip of the claw.

1. —Received for publication July 15, 1943.

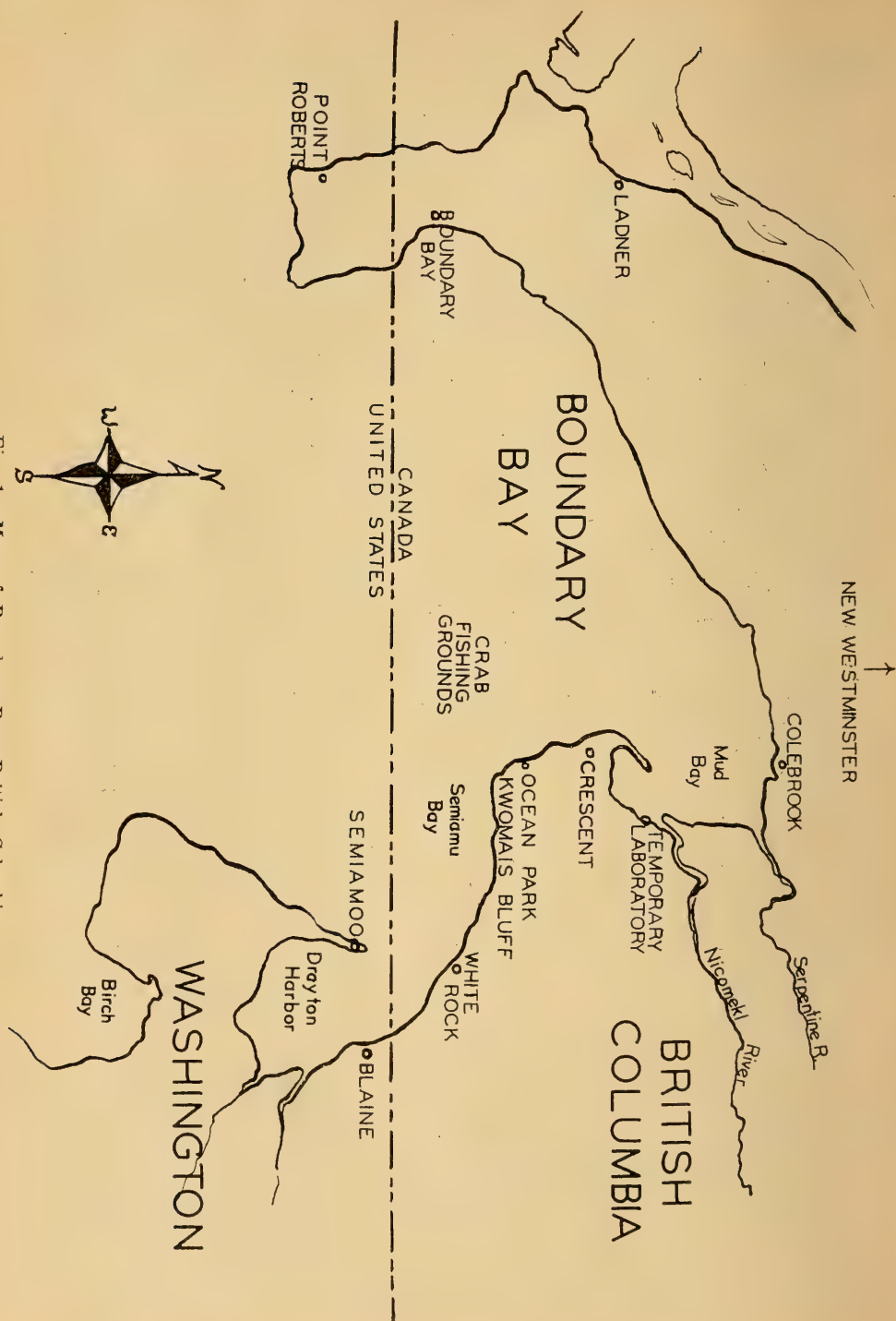


Fig. 1. Map of Boundary Bay, British Columbia

- (5) Length of the first pair of walking legs from the articulation of the coxa with the sternum to the tip of the dactylus.

Under the species name in each case is given a reference to a good description of the species and an illustration of same. Additional references will be found at the end of the paper.

Illustrations of all species listed are included in Figure 2.

SUBTRIBE BRACHYGNATHA

SUPERFAMILY OXYRHYNCHA - the "spider crabs"

Family Majidae

OREGONIA GRACILIS Dana

THE DECORATOR CRAB

Rathbun, *U. S. Nat. Mus. Bull.* 129, p. 71, figs. 19 and 20, pls. 24 and 25, 1925.

The "decorator crab" as the name suggests is often adorned with marine growths such as sponges, algae, bryozoans, and hydroids. In consequence of these decorations, the animal is inconspicuous when at rest.

Colour: Tan or gray dotted with red. However the colour is often obscured by the decorative covering.

Size:

(a male):

(1) 575 (2) 222 (3) 301 (5) 980.

(a female with eggs):

(1) 374 (2) 109 (3) 215 (4) 345 (5) 465.

Local distribution: Several specimens almost covered with marine growths were collected in Boundary Bay but the species is not common in this locality.

General distribution: Nunivak Island and the Commodore Islands in the Bering Sea to Monterey Bay, California; Honshu Island, Japan. Shallow water to 212 fathoms.

PUGETTIA GRACILIS Dana

THE "GRACEFUL KELP CRAB"

Rathbun, *U. S. Nat. Mus. Bull.* 129, p. 172, pl. 58, figs. 64 and 65, 1925.

Colour: Greenish-brown to reddish; body commonly decorated with algae and seaweeds.

Size: (sex not noted) (1) 374 (3) 271.

Local distribution: Only one specimen of this species was found in Boundary Bay. It was densely covered with marine growths in the region of the rostrum.

General distribution: From the Western part of the Aleutian Islands to Mendocino, California. Shore to 40 fathoms.

PUGETTIA PRODUCTA Randall

THE "KELP CRAB"

Rathbun, *U. S. Nat. Mus. Bull.* 129, p. 167, pls. 56 and 57, 1925.

As the common name suggests, this crab is usually found adhering to kelp and other seaweeds. The specimens examined had numerous barnacles on their carapaces.

Colour: Dark brown, greenish brown, or even a bright red on the dorsal surface; ventral side lighter.

Size:

(a male):

(1) 781 (2) 148 (3) 645 (4) 1187 (5) 1359.

(an egg bearing female):

(1) 727 (2) 120 (3) 633 (4) 701 (5) 1105.

Local distribution: Not common in Boundary Bay.

General distribution: Northern British Columbia to Santa Rosalie Bay, Lower California, Mexico. Shore to at least 40 fathoms.

SUPERFAMILY BRACHYRHYNCHA

Family Cancridae

CANCER PRODUCTUS Randall

THE "ROCK CRAB" OR "RED CRAB"

Rathbun, *U. S. Nat. Mus. Bull.* 152, p. 203, Fig. 32, 1930.

This species is edible and is eaten in California. It is seldom used for food in British Columbia.

Colour: Carapace dark red above; yellowish white beneath. In the early post-larval instars the carapace may differ markedly from that of the adult in appearance - mainly by being striped rather than plain.

Size:

(a small striped male):

(1) 312 (2) 30 (3) 481 (4) 383 (5) 411.

Local distribution: Common on rocky shores; uncommon where it is sandy or muddy. Absent from Mud Bay and other parts of Boundary Bay that are ecologically similar. Caught frequently in the commercial crab traps and the young are found on the traps and lines of the commercial fishermen in considerable numbers in the summer months. The young are also to be found at low tide in rocky areas in the vicinity of the town of Whiterock.

General distribution: Kodiak Island, Alaska, to Laguna Beach, California. Low water to 56 fathoms.

CANCER MAGISTER Dana

THE "PACIFIC EDIBLE CRAB" or "MARKET CRAB"
Rathbun, *U. S. Nat. Mus. Bull.* 152, p. 222,
figs. 35 and 36, 1930.

The Pacific Edible Crab is an economically important crustacean from Alaska to California. It is fished commercially in many parts of British Columbia but particularly in Boundary Bay, Burrard Inlet, Saanich, Sooke Harbour, Nitnat Arm, Clayoquot Sound, Quatsino Sound, Prince Rupert, Nass Harbour, Masset, and Naden Harbour.

In Boundary Bay this species supports a considerable fishery both on the Canadian side of the international boundary and on the United States side. The commercial crabs caught in the bay are shipped mainly to Vancouver and New Westminster, B.C., and to Bellingham and Seattle, Wash.

The fishing methods for the Pacific Edible Crab differ from those used in other fishing areas in that bait is not used in the traps which are put out on the fishing grounds in "lines" of 50 traps to a line. One fisherman usually fishes several lines each of which he hauls at least two or three times each week.

The writer has elsewhere (MacKay, 1931, 1934, 1942, 1943; MacKay and Weymouth, 1935; Weymouth and MacKay, 1936) reported on the growth, life history, migrations, and form changes of the species. Mating occurs from April to September, egg bearing from October to June, and moulting from May to September; megalops are to be found from May to September. Crabs in the early post-larval instars are frequently found adhering to traps and to trap lines throughout the summer months. Crabs a little larger are to be found in large numbers on the commercial oyster beds during the same season and it seems likely that young oysters may form a part of their food just as they in turn form the food of larger animals. Sexual maturity is ordinarily attained in the fourth or fifth year and the minimum legal size (6½" or 165 mm. carapace width) in the seventh or eighth year. It seems likely that the largest males (180 or 190 mm. carapace width) may reach an age of ten years.

Colour: Reddish-brown above and whitish beneath.

Size:

(a male):

(1) 711 (2) 54 (3) 1111 (4) 938 (5) 1101.

(a female):

(1) 896 (2) 63 (3) 1383 (4) 1079 (5) 1341.

Local distribution: This crab is widely distributed throughout the bay with the exception of Mud Bay where the muddy bottom and low salinity (two rivers enter the bay at this point) probably render the environment less suitable for the species.

General distribution: Unalaska, Alaska, to Monterey Bay, California. Shore to 50 fathoms.

CANCER GRACILIS Dana

THE "SLENDER CRAB"

Rathbun, *U. S. Nat. Mus. Bull.* 152, p. 219,
Fig. 34, 1930.

Colour: The colour is olive with numerous reddish spots that give the crab a reddish aspect.

Size:

(a male):

(1) 378 (2) 30 (3) 559 (4) 550 (5) 653.

Local distribution: Several specimens and the cast exoskeletons of others were collected in shallow water or on the beach near White-rock. The species seems to be abundant in this bay and it is seldom, if ever, taken in the commercial crab traps.

General distribution: Prince of Wales Island, Alaska, to Playa Maria Bay, Lower California, Mexico. Low water to 56 fathoms.

TELMESSUS CHEIRAGONUS (Tilesius)

THE "HORSE CRAB"

Rathbun, *U. S. Nat. Mus. Bull.* 152, p. 150,
Figs. 21 and 22, 1930.

The carapace and walking legs of this peculiar looking crab are covered with stiff setae arranged in irregular rows. Moulting occurs in Boundary Bay during April, May and the first weeks of June when numerous exoskeletons are washed ashore.

Colour: Yellowish-brown.

Size:

(a male):

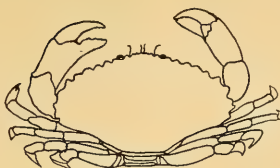
(1) 513 (2) 93 (3) 639 (4) 483 (5) 830.

(a female):

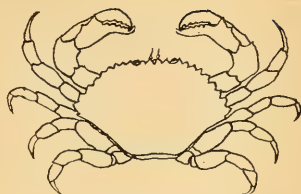
(1) 468 (2) 82 (3) 565 (4) 414 (5) 655.



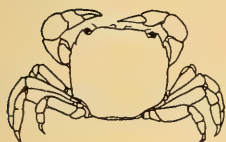
THE PACIFIC EDIBLE CRAB
CANCER MAGISTER



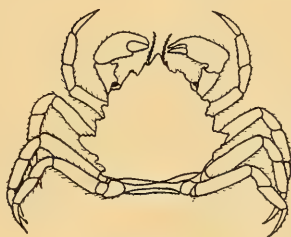
THE ROCK or RED CRAB
CANCER PRODUCTUS



THE SLENDER CRAB
CANCER GRACILIS



THE PURPLE SHORE CRAB
HEMIGRAPUS NUDUS



THE HORSE CRAB
TELMESUS CHERAGONUS



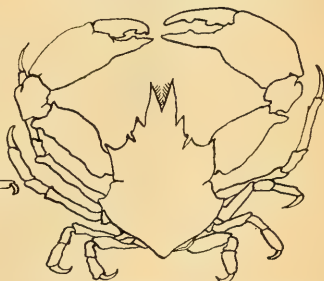
THE YELLOW SHORE CRAB
HEMIGRAPUS OREGONENSIS



THE KELP CRAB
PUGETTIA PRODUCTA



THE DECORATOR CRAB
OREGONIA GRACILIS



THE GRACEFUL KELP CRAB
PUGETTIA GRACILIS

Fig. 2. Illustrations of Brachyuran Crabs of Boundary Bay, B. C. For sizes see text.

Local distribution: Small specimens of this species and the cast exoskeletons of others are fairly common in parts of Boundary Bay and notably near Whiterock and Kwomais Bluff; none were found in Mud Bay.

General distribution: This species has an unusually wide distribution. It is found from the Bering Sea to Northern California as well as along the coasts of Siberia and Japan.

Family Grapsidae

HEMIGRAPUS NUDUS Dana THE "PURPLE SHORE CRAB"

Rathbun, *U. S. Nat. Mus. Bull.* 97, p. 267, pl. 69, 1918.

Both this species and *Hemigrapsus oregonensis* have carapaces that are almost square. However these two common species differ in size, colour and in the fact that in *H. nudus* the legs are without the numerous hair-like setae found in *H. oregonensis*.

Colour: Purplish or mahogany red; red spots on chelae.

Sizes (a male):

(1) 271 (2) 34 (3) 314 (4) 424.

Local distribution: Common on rocky shores, several being often found clustered under a single rock.

General distribution: Sitka, Alaska to the Gulf of California, Mexico.

HEMIGRAPUS OREGONENSIS Dana

THE "MUD CRAB", "HAIRY SHORE CRAB"
or "YELLOW SHORE CRAB"

Rathbun. *U. S. Nat. Mus. Bull.* 97, p. 270,
pl. 70, 1918.

Colour: yellowish-gray.

Size: (a female):

(1) 189 (2) 25 (3) 221 (4) 203 (5) 245.

Local distribution: Very common in Mud Bay and on muddy parts of the shore generally. The burrows made into the banks of streams by this species often cause portions of the bank to collapse.

General distribution: Prince William Sound, Alaska, to the Gulf of California, Mexico.

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THE NATURAL HISTORY SOCIETY OF NEW BRUNSWICK

— An Historical Note —

By R. P. GORHAM

Dominion Entomological Laboratory, Fredericton, N. B.

ORGANIZED IN 1862, the Natural History Society of New Brunswick was an expansion of a still earlier association of geological students formed in 1842 under the name of the Steinhammer Club. The collection of geological and other specimens gathered by the early science workers belonging to this club formed the nucleus of the museum which was begun in the Mechanics Institute and continued by the Natural History Society and out of which developed in 1934 the New Brunswick Provincial Museum.

The Society began in 1882 the issue of an annual publication under the name of the Bulletin of the Natural History Society of New Brunswick. Thirty-one numbers making up six complete volumes and one part of Volume seven were issued the last appearing in 1914, the first year of World War I. War activities including the utilization of field and forest products received the whole attention of the members during the next five years. After that there followed an expansion of activity along educational lines, at first for the benefit of the young people of Saint John but later for teachers in the public schools of the Province and their pupils. This work developed very rapidly and soon

taxed beyond capacity the rooms of the Society and led to the collection of funds for the construction of an enlarged museum where the increasing educational work could be adequately carried on. In this building the collections and library of the Society were housed and the educational work further expanded through the giving of regular lecture courses, the preparations of lesson sheets, charts and specimens for use in the schools of the Province.

In 1942 the Province undertook the responsibility for the operation and maintenance of the Provincial Museum and the educational activities. A reorganization of the Society made it possible to again undertake the publication of a journal in which could be included the records of scientific research in the Province. Closely affiliated with the University of New Brunswick and the Provincial Museum the Society now begins the publication of the Acadian Naturalist, being part two of Volume VII of the Bulletin of this Society. Continuity of issue is preserved through making it part of the volume begun in 1914. The slight change in name has been made so the results of studies made in the general Acadian region but extending outside New Brunswick may be included.

CURRENT LITERATURE

TARAXACUM IN ARCTIC CANADA (EAST OF 100° WEST.) By *Gustaf Haglund*. *Rhodora* 45: 337-343. 1943.

This is a taxonomic treatment of the genus *Taraxacum* in our eastern Arctic regions by Dr. Haglund, Lund, Sweden. A dichotomous key is presented using outer phyllaries and achenes as criteria for larger divisions and

leaf outline for separating other species. Eleven species are considered, of which five are newly described. *T. Malteanum*, *T. pseudo-norvegicum*, *T. russeolum*, *T. umbrinum* and *T. dentifolium*. The work is a joint contribution of the University of Lund and the Arctic Institute of the Catholic University of America. —M. N. ZINCK.

Peter E. Crowe summarizes the mammals collected by recent American Museum Field parties in the southern Rockies of Alberta and British Columbia (1943, *Bull. Amer. Mus. Nat. Hist.*, 80, pp. 391-410; pl. XXXII-XXXIV. It is a well done list, with taxonomic

and life history notes on many of the 53 forms listed. The plates show scenery. A sketch map showing localities visited saves much time in searching maps, and should be adapted in all important faunal papers. —A. L. RAND.

CURRENT LITERATURE

J. Dewey Soper has brought together his bird notes from the Wood Buffalo Park in a note-worthy annotated list (1942, *Trans. Royal Can. Inst.*, 24, pp. 19-97, pl. 2 and 3 and sketch maps p. 91). In addition to his own information he has searched the literature and included all other records, so it is a complete list of birds from and to be expected in the area. Soper worked in the Park from 1932 to 1934; travelled over some 8,000 miles

in it; made extensive field notes, and collected 1,008 zoological specimens. Life zones and ecology are briefly discussed. Two hundred and seventeen forms are listed, usually under specific headings. However, in some cases determinations of subspecies have been made and it would have been advisable to list them under their proper trinomials. The annotations are largely records and field notes. —A. L. RAND.

WALKER PRIZES IN NATURAL HISTORY — The Boston Society of Natural History has recently announced the Walker Prizes in Natural History for 1944. Two prizes, of sixty and fifty dollars respectively, may be awarded at the discretion of the judges for the best papers on reptiles. These must embody the

results of original unpublished research. The scope of the competition for 1945 is announced as any subject in the field of mammals. Full information may be secured from:

Boston Society of Natural History,
234 Berkeley Street, Boston, Massachusetts.

—EDITOR.

CUMULATIVE INDEX

The preparation of a cumulative index to the publications of the Ottawa Field-Naturalists' Club has recently been discussed. This would include the Transactions of the Ottawa Field-Naturalists' Club (Parts 1-7, 1880-1887); the Ottawa Naturalist (Volume 1-32, 1887-1919); and the Canadian Field-Naturalist (Volumes 33-57, 1919-1943). The preparation and publication of such an index would require a great deal of time and involve con-

siderable expense. Such an index should, however, be of great value to students of Canadian natural history. The Editor would welcome an expression of opinion regarding this proposal from readers and subscribers, particularly from Universities, Museums and other research institutions. Please address all communications to the Editor, Dr. H. A. Senn, Division of Botany, Central Experimental Farm, Ottawa.—EDITOR.

ERRATA

In Nos. 2 and 3, February-March, Volume 57, 1943, page 55, several lines of the Christmas Bird Census for Toronto are confused with the report of the Census for Hamilton.

The list of Toronto observers should read as follows: "J. L. Baillie, F. Banfield, G. S. Bell, A. Boissoneau, F. S. Cook, A. Cringan, J. Crosby, C. Davies, Mrs. Davies, O. E. Devitt, R. G. Dingman, Y. Edwards, F. H. Emery, B. Falls, A. Fryer, R. Fryer, W. Giles, H. M. Halliday, P. Harrington, R. Hicks, C. E. Hope, R. F. James, M. Jarrett, G. Kennedy, R. Lanning, R. V. Lindsay, J. Link, J. MacArthur, J. W. MacArthur, R. MacArthur, D. MacDonald, C. MacFadyen, T. F. McIlwraith, N. D. Martin, Mrs. Mitchell, T. R. Murray, H. Nickle, K. Neilsen A. Outram, J. Outram, B. Perrin, D. Perks, B. Proctor, C. Proctor, H. Proctor,

R. Ritchie, R. Robinson, R. Russell, T. Russell, R. J. Rutter, R. Sachs, R. M. Saunders, D. Scovell, T. M. Shortt, W. E. Shore, Mrs. Sisman, L. L. Snyder, F. Smith, R. A. Smith, W. W. Smith, H. Southam, S. L. Thompson, D. West, J. Wheeler, D. Wilson. — (The Brodie Club)."

The introduction to the report from Hamilton should read:

"HAMILTON, ONT. (Dundas Valley west to Ancaster, Hamilton and Harbor, Beach, Burlington, Aldershot). — December 20, 1942; 8.40 a.m. to 6.30 p.m. (D.S.T.) Clear; 3 in. to 7 in. snow; slight breeze veered to west at return; temp. -15° at start, 7° at return; bay frozen. 33 observers working in 12 parties and at 5 separate feeding stations. Total hours afield, 72; total party miles, 156 afoot.

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